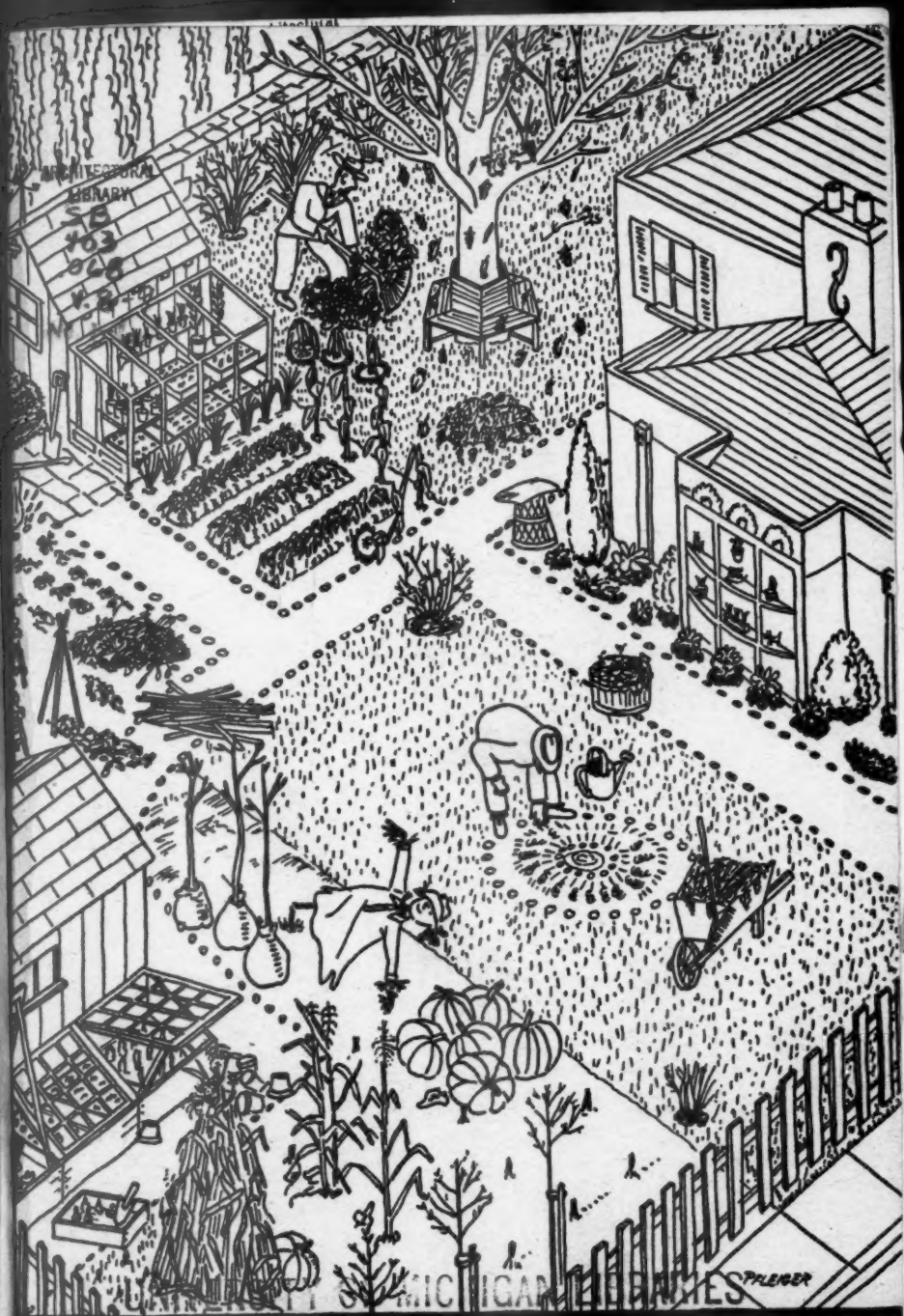

RGANIC GARDENING

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With The Editor

The Human Health Aspect of Organic Farming

I BELIEVE that the most important aspect of organic farming is that of the improvement in the health of people who eat food produced in that manner. It was that phase of the organic farming philosophy that impelled us to purchase a farm about five years ago.

We have read that in certain schools in England, Ireland and New Zealand the health of students fed in this manner was sensationally improved. Their incidence of colds markedly decreased. Their general resistance to disease improved notably. We read of Dr. J. W. Scharff and his remarkable experiment with the Singapore coolies, of the employees of the Winsford Bacon factory in Cheshire, England and of Lady Eve Balfour who in *The Living Soil* stated that she used to have rheumatism and frequent colds but "After changing to compost-grown food my rheumatism disappeared, and I now practically never have a cold. I have now been over a year without even a slight one."

We purchased a farm of 63 acres but the writer could take no physical part in its operation because of the pressure of business interests. It went along under the handicap of wartime labor shortages and other difficulties—farm hands, indifferent, independent, inexperienced. Mistakes in cultural practices were frequent, but one thing we did, and that was made and spread compost. We used not an ounce of artificial fertilizers or poison sprays.

We fattened steers and raised chickens but had no cows because of the impossibility of building a suitable structure during wartime. Every bit of feed for chickens and steers was raised on our own farm organically and it showed in having very fine, healthy animals. We thus had our own steer and chicken meat and eggs but no milk. The rest of our organic diet was in vegetables from our own garden and sunflower seeds. I would say that about 30 per cent of our diet was produced organically.

My seven year old daughter, Nina, was chosen by the school nurse as having the finest teeth in her class. About seven or eight years ago the dentist would always find one or two cavities in my teeth every six months. In the last two years he hasn't found any. About two years ago there was a small beginning of one but the dentist, due

Intestinal Life.
Lift
H. O. Whittemore
2-28-55
Vol. 8:1-6.

to the wartime pressure of work, decided to wait till the next visit. At the next session he found that it had proceeded no further so postponed action again. It is now two years and that tiny, open cavity has progressed no further.

I used to get a severe headache every few weeks but in the last year have practically had none. You cannot imagine what a delightful thing it is to be free of dreadful headaches, and not have to take aspirins or bromo-seltzers. But my most remarkable benefit is in my practical immunity to colds, for there I had a very gory record. A few years back I had a half dozen severe colds one winter, a practically continuous affair, which seriously interfered with my work. During the winter of 1944 I had two slight colds, of very short duration, but in this autumn season of 1945, it is the first time in f. ty years that I have not contracted a cold in September when the first cool weather arrived. There is something about a change in the weather that always gave me a cold, but not so this year and I was exposed several times under severe conditions, wearing thin summer clothes. In the old days that would have meant a sure cold.

I must say also that my mind functions more clearly in the last few years. There can be no question that the brain, being nourished by the blood-stream, should benefit when that stream carries the vital, living elements brought about by eating organically produced food. I can notice it quite definitely. This is not boasting, because it is due not to myself, but to a completely outside factor, my food. You can do the same thing.

As we look forward now to the gradual increasing of our food-producing program, to take in milk, bread, grapes and fruits, it is with a great deal of confidence that we face the future.

We have received hundreds of letters from readers of *Organic Gardening* testifying to the remarkable results they have obtained by applying the organic method in their gardens. They have obtained better plants and less plant pests but I can remember only a few letters telling of improvement in their personal health. One came in, a few days ago from Mrs. H. J. Schauer of Roseville, Callifornia which said, "and since we have learned to raise our fruit and vegetables the organic way our health has improved one hundred per cent."

There were a half dozen letters from persons who had secured benefits from eating sunflower seeds. Of course, *Organic Gardening* has been published less than three years, so that our readers have not practiced it as long as we have. We *do* expect, from now on, to hear of many cases of such health benefits resulting from eating organically produced food.

If medical science could investigate this subject I believe they would find that organically produced food stimulates and adds to our intestinal flora. This flora consists of bacteria, living organisms, which take an extremely important part in digesting our food. Recently at the University of Wisconsin experiments were performed which showed that some vitamines are actually manufactured in the intestines by bacteria. This digestive process is aided by enzymes, which are living substances, but not bacteria. In other words the act of digestion is a biologic process, not a chemical one. Food produced organically is more alive, contains more living elements, which grad-

ually build up an intestinal flora which has a tremendous power of digestibility.

It is the same with soil. What is the measure of fertility of earth? Its microbial population. Given a soil extremely fertile and profuse with bacteria and fungi and it will digest a gunny sack in a few months. A chemicalized soil, with one-half the amount of soil microbes, will take years to do the same thing. Aristotle called earthworms the intestines of the soil. He was right, but he did not know about bacteria. The microscope wasn't invented yet. Together, the earthworm and the microbe represent the earth's stomach. They digest the food for plants. I wouldn't be surprised if they work in a team, supplementing each other's activities. For example, bacteria do not like an acid condition. The earthworm with its calciferous glands is a powerful factor in keeping the soil properly sweetened.

If all the statesmen of the world, if all government officials could eat food produced organically from a fertile soil rich in minerals the possibility of future wars would be greatly diminished.

J. I. RODALE.

Babson's Got Something

MANY people have read Roger Babson's column not only to follow his financial advice, but for the enjoyment of his incidental observations. On September 27, he wrote about his mother's kitchen and the good foods of olden days. He too feels that modern foods raised with chemistry do not measure up in taste and quality to those grown on virgin soils rich in good old humus. "Not only were the vegetables and other products of the soil much better in those days, but also the cattle and poultry, including the milk, eggs, and butter." And he goes so far as to deplore modern fans that draw out kitchen odors: "As a result, that important aroma which comes from the bacon at breakfast, the roasts of meat at dinner, and the stewed fruits at supper is thrown away into the air. Yet these aromas are most necessary for developing the gastric juices so important for arousing our appetites and digesting our foods." This latter thought I think is typically Babson, original and true. Nothing like a good kitchen fragrance—if it isn't too much of cabbage.

Farming and Gardening for Health or Disease

By SIR ALBERT HOWARD, C.I.E.

Farming and Gardening for Disease.

FARMING and gardening for disease owes its origin partly to Baron Liebig and the Broadbalk wheat plots at Rothamsted, and partly to the urge of the profit motive. The latter has compelled agriculture to joint the ranks of industry and to work for a profit at all costs. From the former the vast artificial manure industry has arisen. Various chemicals like superphosphate, sulphate of ammonia, and potash salts from Strassfurt in Germany, or a combination of these or of similar substances, are used to stimulate crop production. They have certainly achieved this result as far as quantity is concerned and at first sight they appeared to be helpful to the farmer and gardener and to constitute an advance in crop production.

As the years passed, however, chemical manuring developed a fundamental weakness. The results obtained proved to be only transitory; the method completely failed to pass the test of time. While the vast stores of humus left in our soils by the farmers and gardeners of the last century lasted, all went well. But the advocates of chemical manuring forgot an important factor—the necessity of keeping up the humus content of the soil. Soon the land began to go on strike. Tilth and permeability were lost. The chemical farmers then began to change their ground. The place of the formerly despised humus had to be admitted. Now the farmers and gardeners are urged on all sides to base their manurial policy on humus supplemented by suitable artificials. This is the gist of the advice which is now rained down on us like hailstones from heaven by the vast hierarchy of officialdom ranging from the Ministry of Agriculture, the experiment stations and agricultural colleges down to the local war agricultural executive committees.

How can the average man resist this spate of high-pressure salesmanship? He can do very little. But in Mother Earth he has a silent but very stern ally.

Under repeated dressings of artificials the soil gradually loses its texture and refuses to drain; the crops soon fall a prey to insect, fungous and virus diseases. These have to be kept in check by a regular galaxy of poison sprays. Our dairy herds suffer more and more from such diseases as foot-and-mouth, tuberculosis, mastitis, contagious abortion, and so forth. The maladies of mankind increase in intensity: the hospitals fill up with patients, lunatic asylums are overcrowded; more and more money has to be devoted to medical care, as witness the National Health Insurance Act and its present-day developments.

How can the adverse verdict of Mother Earth on chemical farming be obtained? How can it be in-

terpreted? If we put to the earth itself the question—What is your verdict on the war of the soil: on this controversy between inorganic and organic farming and gardening?—we shall very quickly obtain an answer. This reply must then be interpreted. For this we must make the fullest use of our best experts who are quite convinced that such produce is not worth eating. Their verdict is deliberate, final, and crushing.

Such expert testimony is easily obtained. Take any average permanent pasture, under the turf of which humus is constantly being made by natural agencies. Divide it fairly into three equal strips: manure the middle plot with a conventional dressing of mixed artificials containing sulphate of ammonia; treat the two outside plots with an equivalent amount of freshly prepared compost made from animal and vegetable wastes. We shall then have a comparison between humus supplemented by chemical manures and humus alone.

Everything will soon be ready for the verdict of our best experts on n u t r i t i o n—not statistically minded bipeds, as we might at first expect, but quadrupeds in the shape of the grazing animal. The live stock will concentrate on the two humus areas and graze the herbage down to the roots; they will only lightly pick over the produce of the poisoned soil.

That the middle strip has indeed been poisoned will be evident from the response of our chief soil conditioner and humus distributor—the lowly earthworm. These creatures will leave the plot treated with sulphate of ammonia, but will multiply in the two humus-filled areas. This can be determined by a simple examination of the upturned turves, or better still, by counting the molemills on the three plots. Earthworms, as is well known, provide a part of the food of the mole. Often, when these animals pass from one of these humus plots to the other, they go straight across the artificially manured area and seem to know by instinct that they are not in one of their usual feeding grounds. Consequently many fewer molehills are to be found on this strip.

A few words are needed at this point to emphasize the importance of the earthworm in providing our crops with food. The casts of the earthworm are 50 per cent richer in humus, five times richer in available nitrogen, seven times richer in soluble phosphate, and eleven times richer in replaceable potash than the upper soil. It is little wonder, therefore, that the roots of crops like the potato are always attracted to worm casts and penetrate them in all directions. The weight of such worm casts per acre per annum may run to 25 tons in land in good heart.

The much vaunted and much advertized chemicals, therefore, stand condemned. Our live stock despise the resulting produce; the earthworm goes on strike. Why, therefore, pursue this subject any further and spend time on what has been described as the statistical elaboration of the obsolete? The present methods of farming and gardening are harmful, as is obvious from the general standard of health in this country compared with that of the peoples who are fed on the produce of humus-filled soil. In the nutrition of our population at least two mistakes are made: the food is grown for the most part on poisoned soil; it is afterwards refined, processed, and preserved in various ways. Both these factors cause untold mischief.

Old Fashioned Flowers - Pinks and Carnations

By DORIS CLARK

A FRENCH expert among the readers of Organic Gardening, Mr. Brua of Interlaken, New York, writes on my recent statement about mignonette that in French a carnation is called *oeillet*, while *mignonette* "is a pink, of a white color, very beautiful feathery flowers, and planted in large borders." This brings up the question of pinks and carnations, quite timely for the season, though few home gardeners will have the equipment for producing the tall, long-stemmed flowers that we now can admire in the florists' windows.

Pink is a very comprehensive term, since more than 1,200 different plant species belong to the family, which has the Latin name *Caryophyllaceae*. The matter is further complicated by the fact that early naming connected the fragrance of pinks and carnations with the scent and taste of cloves, though the clove tree belongs to an entirely different family. In German, French, Italian, and even Russian this association exists in the language. When botanical classification started on a systematic basis, it was realized that carnations were a species in the pink genus, named *Dianthus caryophyllus*, as different from other pinks, such as *Dianthus barbatus* or Sweet William, *Dianthus chinensis*, the annual garden pink, *Dianthus plumarius*, the garden pink to which the French *mignonette* belongs, and many others. Remoter relatives are Baby's Breath (*Gypsophila*) *Lychnis*, often called Dusty Miller, Rose Campion or Mullein Pink, and *Silene*, the Catchfly or Campion. The flower gardeners realized these relationships, as their common names indicate, long before anyone began to make distinctions between Rose Campion and Campion or Garden Pink and Mullein Pink.

For all practical purposes, the flower lover must know the names if he wants to obtain the right seeds. But for proper growing, the really important distinction is that of annual and perennial pinks. Take the annual garden pink, *Dianthus Chinensis*, often called China or Indian Pink or Marguerite carnation; it usually blooms the second year if tied over the winter, but must be sown every year in case heavy frosts destroy it. This plant is grown as an annual, though it really is a semi-hardy biennial. The Allwood pinks, bred for fragrance as well as beauty, are called perpetual flowering carnations, but often become the prey of severe winters if grown in the open without benefit of cold frame.

While these cultural distinctions are found in all the catalogues, I personally make an entirely different classification for my own purposes, that between fragrant pinks and odorless ones. The latter may excel in size of flower, beauty of coloring, richness of petals, and sturdy growth. They are excellent for bedding and borders, permanent and temporary, but my love belongs to the fragrant pinks, whether carnation or not. The languages which distinguish between clove pinks, the scented ones with their incredibly rich spicy flowers, and others, however beautiful, made a distinction quite to my liking.

Carnation Dorothy Gordon — J. Horace McFarland

The fragrant pinks include the carnation, the rock garden plant Cheddar Pink, and Stone Pink (*Dianthus petraeus*), the Grass Pink (*Dianthus plumarius*), and the superbly fragrant *Dianthus superbus*. The Latin name of Dianthus or Divine Flower, Flower of Zeus, was given the genus three hundred years before Christ in recognition of its scent. The old English name for these fragrant plants, now usually called carnations, was gillyflower, which derives from the old French word *girofle*, meaning clove. But enough about names which often are confusing and apt to deter the practical gardener after he has ordered his seeds.

The clove pinks, as we shall now call the scented ones, are all of easy culture if the soil is relatively poor and dry. Under natural conditions most of these flowers appear on limestone mountains, growing in the small residues of loam that the natural exposure of those high-lying ledges left to their roots. Next to them, you find thin and wiry grasses, similar in leaf form to the carnation, and rugged little rock plants with hard wiry stems, comparable to the knotted stems of our scented divine flower. Thus a good subsoil loam without much organic matter, but rich in lime, is the natural soil for successful growing. As in nature, the location must be well drained. Where water stands, you cannot grow carnations.

If you mean to grow double flowers, you cannot rely on self-sown seeds because in the wild state all these plants are single rather than double. Thus you have to make layers of cuttings. Under the impact of the summer sun, our carnations grow from modest seedlings to tufted bunches or, more often yet, to wiry stems with long internodes. In the axils of their leaves, buds develop into the well-known bunches which can be broken out and propagated in the open or, better, in small pots or flats filled with fresh loam to which sand was mixed. By this means of propagation you can, like a commercial gardener, increase your stock in the most beautiful specimens if you can set up a cold frame for the winter or transplant into larger pots and keep them inside the house in a cold or at least cool room. For the tradition of cool, wind-swept exposure is deeply rooted in the hereditary set-up of the clove pink, and the gardener's carnation house is therefore separated from the hothouse by a wall because these plants want fresh cool air of low humidity. This, of course, makes it almost hopeless for the Southern gardener to grow carnations in the open, and only some of the odorless pinks succeed there well, though exceptions must exist. If any of our readers has fragrant pinks in a Southern garden, we should be glad to learn from him or her.

There are many gardeners who never have grown carnations, though they are accomplished in producing much more difficult plants. All the catalogues contain good varieties, especially the Chabaud strain. I have never as yet encountered a highly spiced yellow carnation, and perhaps the breeders have not yet succeeded in combining the inherited fragrance with this unusual color; for the natural pigment of carnations is, as the common name *pink* says, on the reddish side, and even some of the white varieties appear when reseeding quite frequently with tiny red specks.

Those who like cutting their flowers and placing them in their vases in the house, must have tall vases.

One single red carnation in a tall glass vase is a beauty in itself, though a bouquet of various colors or carnations between annuals and perennials of all sorts are equally attractive to the tasteful home-maker. Needless to say that this rugged plant with the hard stem can be made to last for weeks in a cool room, if only the end of the stem is snipped off every morning the same as you would do with gladioli. This task used to fall upon me when I was a little girl and perhaps my love for the flower dates back to this early occupation, though I always remember a saying of my younger brother who was then about four years old: "Oh, how I wish I could eat carnations!" and I can yet see his shining face enraptured with delight over the scent of this most fragrant, Divine Flower.

What Happens to Lead Arsenate?

COMMERCIAL GRAPE orchards use considerable amounts of lead arsenate sprays. One third of the arsenic as well as of the lead adheres to the berries at harvesting time, it was found by Frear of the Pennsylvania Experiment Station. Even where the berries are pressed, much of the poison remains in the juice—half of the lead and three fourths of the arsenic. Some of the lead settles out during storage. Just the same, if a person were fond of grape juice, he might get a goodly amount of dangerous poison into his system. There is only one way out: Not to spray, or to grow your own grapes and bag them if insect pests should arrive.

How Did the Old-Timers Do It?

"THE USE OF commercial fertilizers for ornamentals in general, and greenhouse culture in particular, is of comparatively recent origin. Such organic materials as manure and bone meal have been in use for a long period, it is true, but the introduction of the so-called 'chemicals' into ordinary greenhouse routine is very recent." This excellent bit of thought food appeared in a well known book by Professors Alex Laurie and Kiplinger, entitled *Commercial Flower Forcing* (Blakiston, 1945). If the old gardeners were successful over long periods, we might be wise in following their example.

Carnations and Organics

By HEINRICH MEYER

ONE of the most famous growers of carnations, the breeder Allwood, after whom the perpetual flowering carnation is named, writes in his classic, *Carnations And All Dianthus*, 2nd edition, 1935, (published by himself at Hayward's Heath, Sussex, England) from an age-long experience as a commercial grower. He handles tens of thousands of plants every year and breeds thousands with a watchful eye to perfection. The ideas of a practical breeder of repute always deserve of our attention, but especially so when his ideas are in agreement with the wider theory of organic gardening.

"At the present time, it is known how to combat all carnation pests, and the dread of them is rapidly becoming less, but it is interesting and important to note that each year we kill off the weaker insects, the stronger and more resistant remaining to breed, so there must be constant study to improve our methods of eradication." (p. 131). This eminently wise observation would naturally occur to a breeder who views developments rather than isolated facts. His statement confirms the experiences in this country—notwithstanding the extended spraying programs of the past decades, we have more vicious insect pests than ever before. Some of the insects have become immune to poison spray.

"It is ridiculous to endeavor to feed a carnation unless the soil is in a correct condition. A well-prepared compost will not only fix the existing plant food in the soil, so far as is possible, but will prevent loss of any additional plant food given artificially." (p. 106). This emphasis on compost from a grower who has tens of thousands invested in one particular crop is doubly important when we understand that Allwood opposes all chemical feeding; the additional plant food of which he speaks is all organically prepared. In fact, he plants pastures and has cows on them in order to reap afterward good compost for his beds.

"Many diseases," he says, (p. 117) "flourish through propagating weak and poor cuttings or cuttings from tainted stock, rooted or grown in too great a heat, or, what today is most common, from plants grown in old soil which is excessively fed with chemical fertilizers, and thus weakened." He concludes therefore that plants which are attacked by diseases are unhealthy from some cause, and that healthily grown plants will resist or overcome attacks.

One of the most important aspects of carnation growing is, of course, the propagation by cuttings. While some varieties are increased by seeds, the fine plants with long stems all showing the same color are reproduced a-sexually, by cuttings, just as we graft or bud roses and apples in order to keep the strain pure. Allwood knows about hormones, but his observation about suitable cuttings is worth remembering because it has a wide application of all such propagation. "The old growers used to prefer the base cuttings—that is, those which are produced from the main stem of an

J. Horace McFarland

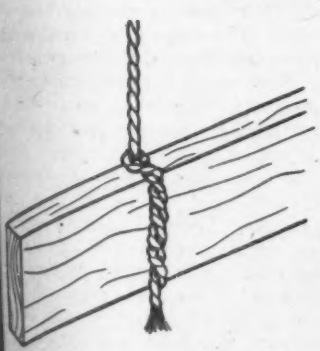
This fragrant Dianthus is named after its originator—Dianthus Allwoodi.

old plant just above the ground; but experience has taught me that these are in no way so prolific as those produced higher upon the flowering growths of the plant—indeed, if the stiff, half-dormant cuttings are taken repeatedly from the base of the plant or branch, they will eventually produce little or no bloom, but an abundance of fine foliage and useless cuttings. Likewise, the thin top cuttings, which have a stem before the first set of leaves should be avoided, for they will never make strong, shapely plants, but will produce an abundance of small flowers with weak stems." (p. 19).

The plant physiologist who studies the bio-chemical and biological conditions of flowering may well take a cue from this observation which confirms what orchardists have believed, though scientists were not yet able to confirm the belief, namely, that grafts made from outside twigs that have shown bearing capacity produce higher yielding trees than grafts made from random cuttings. As W. L. Howard says in his study of Burbank, with which our own booklet by Mr. Smith may be compared, Burbank liked to make his grafts far out on the old branches. This would, of course, produce quicker maturity of the grafts. It is possible that fruit-bearing branches induce better fruiting than branches that have not borne before; it is just as likely that Mr. Allwood's observation on cuttings would apply to buds and scions in roses and fruit trees.

The organic gardener looks at a plant not as a machine, but as an organism. Mr. Allwood sometimes goes so far as to say that his carnations have emotions and respond better to the treatment of the one who loves them. This describes a common experience of good gardeners. The main point is to find out what the plant wants and needs, not what we with our limited human experience think it should have. Gardening is like bringing up children; plants have their own needs and demands. If given natural treatment they will thrive best and grow the healthiest; if artificially fed or pampered, they will get sick and suffer.

The Proper Hitch



In a recent Gardening Device, the Timber Hitch was described. But in the picture there was a slip. If you use the hitch, as illustrated here, the heaviest log or beam will be held tight; it can be dragged or lifted, the hitch will only become firmer.

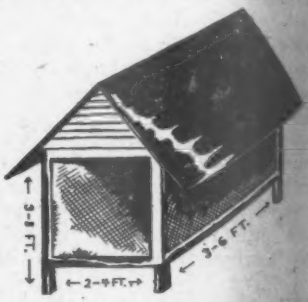
The Home Storage of Garden Products

By DR. EHRENFRIED E. PFEIFFER

WITH the recent development of quick freezers storage problems of garden and field products have been made much easier. However, few people have as yet a quick freezer on hand; also many fruits such as apples, pears, plums, as well as potatoes and beets cannot be frozen. Also it would seem of interest to preserve a few of the oldfashioned methods before they are forgotten. Therefore we will here present a few rules for home storage, some of them having come to us through centuries of experience.

One of the oldfashioned standbys for storage is the root cellar. It does not need to be a real cellar, it could be a basement room, even a shed above ground, but its main condition is that of an even low temperature and medium humidity. A deep cellar is best, because it retains a more permanent temperature. The oldfashioned farmhouse usually has a dug out cellar underneath or a cave cellar nearby. The floor should be trodden earth or rammed clay, for this keeps much drier than any other material, concrete particularly sweats easily. And then we have the second and probably the most vital condition: Medium low humidity. About 40-50% relative humidity are best. Too dry an air makes fruit shrink, too moist, of course, speeds rotting. Mold fungus prefers to grow above 65% humidity and above 55° F. Every change of temperature also changes the humidity and frequent changes also cause condensation of air moisture. Then we have to reckon with water dripping from pipes, girders, ceiling etc. and the trouble starts.

A good root cellar, therefore, has thick walls of stone or double walls with an air space in between, or the interspace is filled with fibre glass, rock wool or cinders. Every storage room above ground should have a double wall. It is safer to have an air space in case one is not able to seal the interspace moisture tight after it is filled with insulating material. Insulating material is effective only when it is filled in dry and kept dry afterwards. Storage spaces



above ground should have double doors, which do not open at the same time thus keeping the outside air from moving directly into the room. The worst thing for a storage room is to leave the door open.

Now to the storage of garden products. The major space will be occupied by potatoes and fruit such as apples, pears and plums; there may be also cabbage, brussels sprouts, red beets, turnips and peaches. There should be enough air circulation between all of these so that no moisture pockets are formed. The storage room will have one or more bins for potatoes, beets, carrots, parsnips and salsify, and

shelves for the fruit that needs frequent controlling. The shelves should be easily accessible, if possible, from both sides. Neither fruit nor potatoes should come in contact with the outer walls. These may be covered with a film of moisture when the weather changes and therefore decay starts from there.

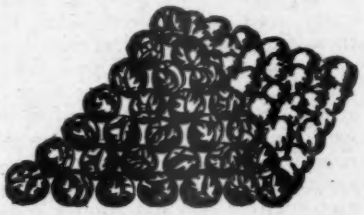
Potatoes, carrots and beets can be stored directly on the clay floor. Should one for any reason doubt the dryness of the floor a layer of straw (wheat or barley straw is best) or peat moss may be put on it. However the best storage of potatoes we have seen is when they were put in dry sand, each layer of potatoes being sprinkled with another shovel of sand. We knew of a farmer who early in spring put his potatoes into a real sandbed in his cellar. The potatoes then, having already lost their shine, absorbed some of the moisture and influenced by the bedding formed a new skin. People buying from this farmer sometimes thought that he had new potatoes. Sea or river sand with its smooth round kernels works better for this purpose than the sharp edged "broken" sand from quarries. Potaotes should be checked from time to time and particularly towards spring all sprouts should be removed. Also when filling the bin, all potatoes showing a deep lesion or disease should be removed. Another way or storing potatoes is to put them into peat moss.

Carrots, turnips, beets, salsify, parsnips can be stored in the same way, e. g., in a sand bed or in peat moss. They will keep better and will not wilt then. If straw is used it should be chopped, except the bottom layer which may be long straw. Oat straw heats up and cannot be used. Round shaped red beets and turnips can be piled up into a pyramid as described for cabbage.

Celery can be stored and bleached at the same time. Put the roots into a box filled with sand or peat moss. The plants are carefully trimmed and packed closely together, standing upright. The interspaces are filled with sand or peat moss until all is covered. The sand or peat moss is watered from underneath or from the side through holes in the box. Or better yet: it is only moistened; a wick led from a can into the bottom layer may do. The leaves are kept dry. The bleached celery can also be stored by packing upright in a box with moss. Trim closely and tie together with a string.

Onions require a dry cellar. They are better put on shelves, but can also be stored between straw or chaff. If stored outside they can stand freezing, but not frequent alternating of thawing and freezing. A north site is selected and a small frame shed built with chicken wire like a corn crib. Put a tar paper roof on it overhanging on both sides so that the rain cannot splash on the onions. Onions should be dried in the sun first. If they are frozen they will not keep long after thawing.

Red and white cabbage is best piled up in pyramids. If stored in



a loft it may be protected against freezing with a thick layer of long straw. The pyramids are carefully

built up. Enough air will circulate in between the interspaces to insure proper condition. It is important that cabbages be not banged about before they are piled up. The leaves are covered with a fine natural protective film of wax. Bad or damaged cover leaves should be removed.

In order to secure good keeping quality of leafy vegetables it is wise not to collect them during bright sunshine, when the surfaces are slightly wilted or as long as there are drops of dew or rain adhering.

Apples are usually put on a shelf made of rows of slats or of screen wire. The apple like any other fruit is covered with a thin layer of protective wax. The less this layer is touched the better the fruit keeps. It is self-evident that carefully picked apples, put immediately into a basket with some chaff or hay keep better than apples collected from the ground after shaking the tree—particularly when left overnight or dropped on wet grass.*

A thin layer of loose straw dropped on the shelf will provide a good bedding for apples and pears; a thin layer of fine hay works still better. A farmer who cared particularly for high quality and flavor in his fruit used only fine hay of sting nettles into which he bedded deeply his plums, prunes and peaches. That nasty weed did indeed keep all those fruits with a vulnerable skin in the very best condition. Why that? The sting nettle has formic acid in its stinging hairs and it is very possible that this "atmosphere" has a preserving effect. Formic acid is also used elsewhere as preservative. Hay has also the possibility of absorbing a certain, though small, amount of moisture, just the amount which otherwise would cover the fruit with "sweat" and start mold. The recent discovery of bactericidal effects of gramacin and other bacteria which develop on hay may also hint an explanation for the keeping quality sustained by hay.

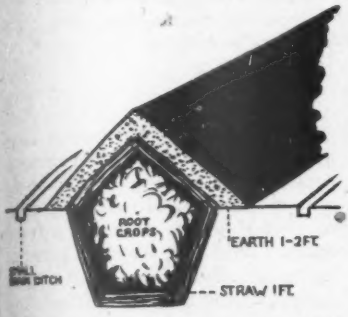
That all this fruit has to be checked frequently is self-evident. Once mold or rot has started, it will spread quickly from fruit to fruit. Therefore it is better to store it so that one individaul piece of fruit does not touch another. This may sound complicated, but it pays for the time by preserving high quality. By the way, people frequently store juicy fruits like plums and peaches in a refrigerator. They do not seem to realize that overcooled fruit rots much easier afterwards. Pears keep better if picked when not quite ripe. Quinces will after-ripen during winter and are then much better.

An old farmer's wife, whom we visited as children, used to keep apples beneath her bed in a drawer. (Remember those oldfashioned French beds in an alcove!) These apples underneath the bed used to keep exceptionally well. Once this writer thought the closed-in atmosphere of the alcove that contained little oxygen and was seldom renewed, had something to do with preserving the apples. This writer discovered that carbon dioxide in small quantities in a store room (just by opening the valve of a carbon dioxide bottle at intervals for a short time) helped to keep stored vegetables fresh. He mentioned this to the chief chemist of a big food concern and asked his collaboration

*FOOT NOTE:—I realize that the commercial way of bathing fruit in a weak dilution of hydrochloric acid in order to remove adhering traces of lead and arsenic spray and of covering them afterwards again with paraffin is—though very effective—about the opposite of our procedure.

for a trial. This was refused, but some time later some patents were taken out on the process and storehouses started on the strength of it.

Root crops in large quantities which are not needed right away can be stored in a trench or earth pit. The sketch will explain the



principle. One digs out a trench, lines the floor and walls with a one foot layer of long straw, piles into it the crops of beets or turnips carefully and covers them with another layer of straw and earth. The layer of earth must be at least one foot thick, so that light frost will not penetrate. This earth pit should be started in dry weather, on a place where water does not collect underneath or on top. The crops will keep till spring if the frost does not penetrate. Once opened the pit should be emptied quickly or a double door with straw in-between must be made at one end. The sketch will explain how to make these earth pits. If one realizes the principle, namely that dry earth, air and straw insulate against freezing, there will be no difficulty in building the pit and finding the proper thickness of the walls and insulation.

There remain to say a few words about seed storage. Seed should be dried before put into any kind of container. It should be allowed enough air to avoid sweating. Seed which has been exposed to any kind of "borer" beetle, should be moved frequently. The maggot of the borer does not seem to develop if the seed is f r e q u e n t l y (twice weekly) shaken. This is true of grains (wheat) as well as of peas and beans. We saw "beans" stored in a cardboard box "crawling around" the following spring when the box was opened. A fine mesh wire basket, where one can always see what's going on, is preferable in such a case. For seed storage the dryness and coolness of the air is most important. Seed does not mind sub-zero temperature so long as it is dry. When exposed for a while to very low temperatures it will even keep much better and germinate more quickly. All seeds which are grown in juicy fruits, such as tomatoes, cucumbers, pumpkins etc. have to be freed from adhering fruit tissue, washed, dried and then kept.

Of all the garden crops squash and sweet potatoes are about the only ones which require not too cold a storage. Sweet potatoes may be kept in a warm place bedded in chaff or dry sand. Squash likes an even temperature of 50° F. It needs careful handling in order to avoid bruises.

Half ripe tomatoes will afterripen in the fall if put on straw inside a cold frame well ventilated.

What Herbs Can Do for a Garden

By EVELYN SPEIDEN

EDITOR'S NOTE: Miss Speiden, known through her work for the Bio-Dynamic Farming and Gardening Association, first published this article in *The Forerunner*.

THE modern world is re-discovering herbs for use in the making of perfumes, condiments, flavorings and medicines, and learning that an herb garden can be a delightful place. But herbs have another importance. By influencing the soil, insects and other plants they can be a vast help to a garden, and so, indirectly, to man. This is the aspect under discussion.

Herbs influence the soil's fertility because the action of their roots goes on constantly. Plant growth involves a life process in which matter is taken up and organized to form the plant body, but there is involved more than a mere addition and subtraction of chemical elements. Within the soil constant infinitesimal changes take place, exchanges between plant and soil through the active forces of light, warmth, moisture, and so forth. About some of these delicate "dynamic" activities scientists are just beginning to learn. Boron, for example, is one of the elements in soil only recently recognized as essential to plant life—though in small amounts only. It enables the plant to regulate its water content by closing certain minute cells which control evaporation. One part in 50,000 is sufficient to make a plant drought-resistant.

Other plants perform their services in different ways. The stinging nettle (*Urtica dioica*), having an affinity for iron, can collect enough of this element to break up and tame a wild soil, its mere presence being usually indicative of a good humus content. Mustard and rape, on the other hand, having somewhat alkaline root secretions, are ideal on a slightly acid or mineralized soil, say, a soil hurt and in need of healing after the overuse of mineral fertilizer. Flax acts as a smoothing harrow on crusty and lumpy clay soils—but never plant it on the same place more than once in five years. Caraway's long roots may be a substitute for subsoiling on heavy, wet land, since it leaves it crumbly; but, being difficult to get started, is best planted with a companion crop of peas. Harvest the peas, harrow as though nothing were there—and the caraway comes up later.

As for clovers, it is well known that most of them die out below a pH of 6.0. They belong to that most interesting of all plant families, the *Leguminosae*, the only one able to "breathe in" the air's precious nitrogen. Every farmer knows well the value of legumes in his crop rotations, but they may be used in many other helpful ways from the

trees and shrubs of mixed hedges, windbreaks and mass plantings, down to the smallest garden plants. The proximity of lavender to the legume called Scotch broom, growing naturally on the Mediterranean slopes, may account for the superiority of this lavendar—incidentally, in this country, one of the most difficult of herbs to grow; and we might try introducing near it such a fertilizing element. Indeed, all the plants in our gardens benefit by association with beans and peas, including sweet peas, scarlet runner beans, the edible soy bean, the domestic coffee berry, Chinese salad beans (for sprouts), peanuts, broad beans, and the edible-podded pea. Baptisia, sainfoin and lupines belong here too. Dr. Robert F. Griggs tells us that lupines are the first seedlings to start growth on barren pumice after a volcanic eruption. He went to Alaska for a number of years especially to study re-vegetation in the region of Katmai after its eruption in 1912. In its volcanic ash, almost devoid of nitrogenous compounds and micro-organisms, the lupines were nevertheless always the pioneers. Their roots showed abundant development of nitrogen nodules, and other plants followed close on their heels.

Conversely, members of the buttercup (*Ranunculaceae*) family have a substance in their roots which poisons the soil for clover, being hostile to the growth of nitrogen bacteria. Since this enemy works even in so fine a dilution as 1 to 23,000,000,000, farmers find that clover soon disappears in a meadow where buttercups are increasing. Delphinium, peonies, monkshood and other common garden flowers belong to this family—a family strong and vital, but growing only for itself. After consuming the large amount of fertilizer they crave, these plants leave a sterile humus. Without plenty of good compost, do not expect other plants to grow well in their vicinity.

In contrast, the spurge (*Euphorbiaceae*) family has a way of helping and protecting other tender plants, since, by fostering a soil which preserves warmth, it stimulates conditions in a warmer climate. Gray says it is "a vast family in the warmer parts of the world."

It is important to know whether a soil contains or is practically devoid of certain minerals, but even more to the point is the question of whether or not the plants growing on that soil are able to absorb those present. Some plants just take whatever a soil has to offer in large quantities. They are the "luxury consumers," and include many cultivated plants which have been pampered until they have lost selective powers. Thus their value as food for man and animal becomes more and more one-sided, and they may exert actually harmful effects. Most wild plants, on the other hand —and this includes herbs—have definite mineral requirements, and in spite of poor soil are able somehow to get what they need. The oak, for example, shows a selective absorption for calcium. Oak bark, always rich in calcium, is especially so on sandy soils containing few traces of it. This ability to adapt and survive in spite of (perhaps even because of) adversity accounts for the great vitality of weeds and the high value of many wild plants for medical purposes.

Another way herbs help build and maintain good gardens is by controlling, biologically, both insect pests and plant diseases. Here again prevention is better than cure. Not only individual plants but whole landscapes become diseased through mono-cultural practices, since na-

ture, left to herself, never produces acre after acre of only one kind of plant. Usually the more variation the better, whether in general landscape development, a farm unit or a garden. In medieval horticulture no lines were drawn between the flower, vegetable and herb gardens. All grew together to their mutual benefit. Now, in the plant hormones or acids absorbed from one plant to another we can see a reason for these benefactions. They are connected with the delicate balances which exist in countless numbers in nature, and which man unwittingly disturbs.

Insect pests are but one sign of these upset balances. Restore the right proportions in nature and the pests gradually recede. This does not mean we shall ever be without insects. In a balanced scheme they are a necessity, but, due to man's interference, their destructive powers occasionally become abnormal. How to restore the right conditions we can learn only by long painstaking observation of nature's own ways. For example, we have found that the white cabbage butterfly so dislikes sage, rosemary, thyme and hyssop that if these herbs are planted among cabbages the butterfly becomes too upset to lay eggs there. Again, apple tree sap is affected by the roots of nasturtiums in such a way that it is distasteful to the woolly aphis. Furthermore, thyme, santolina and southernwood repel moths, as tansy does flies and ants. Because flies avoid the vicinity of walnut trees, cattle enjoy lying there, and man may also have greater comfort with a nut tree on his lawn.

A third aspect of conservation by means of herbs is connected with the influence of one herb upon another, and therefore with the quality of the produce and health of the consumer. In this connection, some 5,000-odd experiments conducted by Dr. Ehrenfried Pfeiffer have been concerned with dynamic effects of substances working only in high dilutions, yet able to transform the entire life cycle of plants. Among plants he traced out many likes and dislikes. Strawberries, for instance, like to grow near spruce trees and are further improved by the addition of a few borage plants in the bed. Lima beans grow unusually well near locust trees. Lacking the trees, one might collect locust leaves for a special compost. Likewise an occasional horseradish plant benefits potatoes; a few chervil plants improve the flavour of radishes; stinging nettle increases the oil content of peppermint, and by hindering the fermentation process in plant juices confers greater keeping qualities on nearby tomatoes; whereas parsley grown nearby improves tomatoes in other ways. Yarrow too has a definite effect on the quality of neighbor plants, increasing not so much their size as their resistance to adverse conditions and consequent health. Coriander seed sown with anise fosters both the germination and growth of the latter. The sage, rosemary, thyme and hyssop disliked by the cabbage butterfly not only keep off this insect, but tend to make the cabbage plants more healthy and digestible.

The cabbage, incidentally, is really a monstrosity among plants, its flowering process being so largely subordinated to the leaf formation that its life cycle is easily upset and it decays quickly. To grow around it such plants, herbs and legumes as have a strong flowering tendency helps prevent the bad results arising from this lack of balance.

On the other hand, some plant combinations are bad. Rue and

sweet basil do not thrive near each other. Among the herbs, fennel seems to be of the most doubtful character, the germination of caraway and coriander being hindered by it, bush beans disturbed by it, and tomatoes feeling its blight. Moreover, the temperamental tomato dislikes kohlrabi, and has such an antipathy for quack grass that it kills the intruder right off.

In short, in this vital matter of the influence of herbs upon our gardens, we know much more than ten years ago, but many secrets are yet to be discovered.

Nevada Manure Experiment

A VERY INTERESTING experiment was conducted in Southern Nevada, a land known for its desert appearance, where the soils are very low in organic content, lacking in bacteria and other soil organisms. Those soils are rich in soluble minerals, which form a potential plant food. But how can a first growth be established so that the necessary organics can be added?

The first thing done was, of course, irrigation. This allowed for the growing of alkali-loving plants, such as alfalfa, which formed a ground cover. This in turn made smaller irrigation possible, for while alfalfa is a great consumer of water, it also shades the ground and is thereby a conserver of moisture. But this was just the beginning. G. Hardman who reported about the experiment in the *Nevada Station Bulletin* 171 (1944) entitled his work as follows: *Fertilizers and Manure in the Improvement and Maintenance of Soil Productivity*. He showed that manure, large applications of barnyard manure, not only increased the tilth and water-holding powers of the soil, but had a direct fertilizer value.

Manure increased the yields in the southern Nevada desert enormously. Corn yielded 40% more, alfalfa and clover even 90% more, and, what is equally important under dryland conditions, manure "greatly reduced the water requirement per pound of dry matter of alfalfa". In irrigation areas, where water has to be paid for, manuring thus saves not only the soil, but cash. Nitrogen added in chemical form did not save the water-holding capacity of the soil.

This recent experiment again bears out the soundness of the organic theory.

Over the Fence

by H. K. MEYER

DDT is on the market now. Paul F. Frese of the *Flower Grower* says that this material is death to the honeybees. While Elmer Carroll of *The Beekeeper's Magazine* wrote us recently that there is no concern, the well-known bee expert of the University of California, Dr. J. E. Eckert seems to be worried about the increased poison spraying. On August 25, the conservative *Wall Street Journal* published an item about the danger of DDT to beekeepers. "There is a vital need for state or federal regulation to control insecticide applications," Dr. J. E. Eckert, University of California apiologist, says. "Now any farmer in California except in one county, may release poisonous arsenate or cyanide sprays whenever and wherever he likes. Even if he dusts crops that bees don't visit (such as tomatoes) with power sprayers or by airplane, poison often spreads two miles away into adjoining fields or orchards where bees are working." Nearly 1,500 colonies of bees were killed and more injured in one California county last year by calcium arsenate spraying of tomatoes. The same poison two weeks ago *killed half of the University of California's highly-bred bees* when it drifted into dew (bees' drinking water) and into star thistle weeds alongside a tomato field.

Vegetable-rich Imperial County, at the bottom tip of California, controls insecticide applications rigidly for the sake of the expensive perishables it markets in the East.

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Science News Letter, August 18, 1945, had an item as follows: "Eight or more sprayings of apple orchards are now required to accomplish the results of a single spraying forty years ago. The coddling moth of today is the descendant of the worms that proved best able to resist poisoning in the past." How well this scientific finding agrees with the practical observation and intuition of the plant breeder Allwood, from whom we quote in the article *Carnations and Organics!*

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Both Mr. Faulkner and Mr. Pretzer replied to an item in this column and state that there is no doubt that earthworms dragged celery plants down into their burrows. "Ours is not a lone experience," writes Mr. Pretzer, "as our whole area could substantiate the fact by similar experience." The Cleveland region must offer very little organic feed to the earthworms who prefer half decayed matter to fresh plants. Or the area is otherwise so unique, since there can be *no doubt about Mr. Pretzer's statement*, that an earthworm species living on young plants could develop. This is unusual in the light

of general earthworm data. When Dr. Schoenfeld of the Oregon Experiment Station at Corvallis visited England and was amazed at the fertility of the pastures, the farmers explained rightly that this was due to the abundance of earthworms. Much further information is available in J. I. Rodale's *Pay Dirt*.

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Mr. Bousman, Engineer with the *General Electric Company* in Schenectady, N. Y., has developed a system of chopping down a tree by means of a redhot wire. The cost is far below professional charges, and the tree is cut down piece by piece. The wire is of a special nickel-chrome alloy and keeps its strength when heated by electric current. This method saves elbow grease and adjoining property.

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Keeping up the fertility of the land is not too difficult as the experience with the Morrow Plots of the University of Illinois shows. In 1876, the land yielded fifty bushels of corn, in 1943, after continuous cropping with corn, three bushels of reasonably sound ears were harvested. On another stretch, where corn, oats, and red clover had been rotated, the yield in 1943 was better than in 1876—53 bushels of good quality corn. When manure, lime and phosphate rock were added, the yield was 100 bushels. It would be interesting to compare the nutritive values of these differently grown ears in feeding tests and to compare them with compost-grown corn. For far more important than quantity is *nutritional quality*.

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The first written record of the soybean is in a medical book written under the Chinese Emperor Shen-Nung in 2838 B. C., says E. J. Dies, President, National Soybean Processors Association in *Chemurgic Papers* No. 411. In 1712 the bean was introduced to Europe, in 1804 to America. The recent development is due to Piper and Morse of the Bureau of Plant Industry in Washington. We now grow 200,000,000 bushels annually.

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Chrysanthemum literally means *Flower of Gold*, because the early forms were golden. In the meantime, not only red and white, but blue and violet colors have been developed. Man has brought different species and varieties together and by crossing them advanced the domain of plants, so that now we have small and early-flowering chrysanthemums beside the older varieties that had to be potted every October. It seems almost unbelievable that the first chrysanthemums were introduced to this country less than a hundred years ago.

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A brand new book just published by Henry Holt and Co., New York, comes to us from our friend, Edgar Altenburg, the author. The book—a highly technical work—is entitled *Genetics* and deals with the complicated processes of heredity in men, animals, and plants. An item I did not know before was that a certain cell formation, the centrosome, is common to men, animals, and the lower plants, but absent from the higher, flowering plants. In this respect, we are closer to the fungi than to the roses.

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Speaking of fungi brings to mind the work of Dr. Rayner on mycorrhiza. This work and the whole ques-

tion was initiated in 1882 by Frank in Berlin. It has been brought up to date by Melin in Sweden and Rayner in England. Briefly stated it is this: Some of the toadstools and mushrooms we find in the woods are tied in with tree growth. The mushrooms on top of the soil are merely the reproductive organs of the plants, but under the ground the so-called mycelium, *a webwork of living threads,* lives on as the main plant. These threads attach themselves to the roots of other plants, sapping them to some extent, but returning also nutritive elements. This relationship mutually benefits the trees and the mushrooms and is called symbiosis. Dr. Rayner has definitely established that trees will not grow well if these root-fungi or mycorrhizae are absent. Another sign of cooperation in nature! And another proof for scientific cooperation between different countries!

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If you ever tried to use average garden compost in a seed flat for growing seedlings and cuttings, you have also noticed that inevitably some fungi raised their graceful umbrellas between the expected plants. For this reason, it is better to use sand or sphagnum moss in which all plants and seeds germinate or root readily. The seedlings do not need the nourishment in compost which the growing plants require. Compost should therefore *not be used for starting* plants.

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Orrin Hale writes in *Northwest Gardens and Homes* (August 1945) as follows: "In my own garden is a portion from which the topsoil was bulldozed off as well as a section of black alder-bottom soil, so rich and moist. Potatoes were planted in both sections at the same time. Those in the bottom land are lush and healthy while those in the high ground are weak and spindly. The dust gun was loaded for the assault of the flea beetles. They came. The leaves of the spindly potatoes on the high ground were full of shot holes almost overnight, but none appeared in those of the lower field, and while I was fearful of the results I purposely refrained from dusting them. No flea beetles have appeared on them." This bears out what we have often said here: *Well nourished plants* grown on rich organic soil *become immune to pests.*

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I had the same experience with Japanese beetles, which left the well fertilized garden altogether alone, but went after the weeds on the edges and even attacked the unpalatable marigolds which I had planted at an unfertilized bank. It was almost incredible when the invading beetles *stopped right at the edge of the garden.* It would seem that when trees are befallen by these voracious crowds there trees are undernourished. Even a plain straw mulch helps to keep the trees in good shape and makes them less subject to attackers.

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In Wrench, *The Wheel of Health* (Lee Foundation for Nutritional Research, Milwaukee, Wisconsin) I found an interesting item: "Berg, in 1903, calculated that the number of possible proteins, based on amino-acids, was 6,708,373,705,728,100." This astronomic figure shows why it is better to follow nature than scientists. Their knowledge is

always but a fragment of what should be known for a safe course. We have an instinct and can follow it, long before science catches up with a millionth of what can be investigated.

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One of our helpful readers sent us *Citrus Leaves* (May, 1945) and marked the article "Something must be Wrong" by P. W. Harlan. This same issue contains an editorial and an article on Citrus Decline. California is, of course, this year especially worried about the gradual decrease in first-rate citrus fruit of good size because the fruit was rather small. Considering the enormous investment in groves, the decline in fertility is not only an orchard, but a general economic problem. Some people are on the right track: "Lemon decline is related to soil condition or a combination of conditions which are unfavorable to root health or activity." No doubt, the California growers would have the same success as the South Africans who began to apply compost on a large scale. They should at least try. It's a natural approach.

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Since the Federal Seed Law went into effect in 1940, over two thousand complaints were registered. 110 actions in court took place and considerable fines have been imposed, though these are not large enough to curb fly-by-night operators from selling cheap or old seeds. Needless to say that you are safe in buying from an established seed house.

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Urea and Cyanamid are two of the strongest synthetic fertilizers. These materials are so strong that they are now used to kill not only weeds, but also seeds. Naturally, they affect the life of the soil too, killing off the earthworms and other living things. It is interesting to know that the first start in organic chemistry was made when a druggist in Germany, over a hundred years ago, managed to synthesize urea. One hundred years of chemical industry have changed everything in peace and in war, but they must not change the basis of our existence, soil and its life.

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The breeder knows that animals as well as plants inherit from both lines of ancestry, the maternal as well as the paternal. Breeding cattle by buying a good bull is only half of what's needed. A strange feature in animal breeding is the show ring classification. There are all those points taught to 4-H boys and girls all over the country, points of "conformation" and s i m i l a r standards that have become the ideal, a prerequisite for winning. It is a real relief to see this method debunked in the case of dairy cows. The U. S. Bureau of Dairy Industry has shown that the veins on the udder and abdomen of a cow, long called "milk wells" are no indication of milk producing capacity. It will be a long time, I fear, until the show ring judges accept this finding. But it is gratifying to know that the *Dairy Goat Journal* has come out repeatedly against the mistaken emphasis on large udders and protruding veins.

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Justin Scharff recently wrote in the *Los Angeles Times* the fine statement: "If you're bothered with a poor and unworkable soil then

composting should solve about 85 per cent of your troubles. The amazing thing is that you can turn an almost sterile location into a colorful and fragrant landscape." On the other hand, M. B. Cummings of Vermont warned in the *Rural New Yorker* about Dangers of the Compost Pile. This contribution deals only with the sloppily made heap, not with a heap built along scientific lines. But Professor Cummings knows, of course, well that, by mixing carbon matter from plants and nitrogen matter from animals in the right proportions, a finished plant food can be developed, in which neither mildews, nor dangerous bacteria, nor even weed seeds survive.

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Our contributor, Professor George Williams, the bird specialist, recently published an article in *Auk* showing that the migratory birds have quite some good sense. He proved for the first time that these birds wintering in Central and South America do not fly across the Gulf, but follow the chain of islands or the coastline. Now that winter is here, think of your birds. Not all of them eat seeds, the titmice which were helping you all the time cleaning your fruit trees of insect larvae, may need some nourishment in fat. When you put something outside your window, be sure not to force the small birds to mess themselves up on big chunks of bacon rind, as we have seen them outside many a window. Make the pieces small. These beautiful birds will reward you by their charming presence.

Charles Fort

THOSE WHO HAVE BEEN thinking of taking a jaunt to the moon in a rocket plane powered with atomic energy will read with interest the *Books of Charles Fort*, published by Henry Holt and Co., New York. Among the most brilliant American writers, Fort is also the most devastating critic of science, especially astronomy. He uses scientific methods in interpreting the varied and sundry data relating to visitors from other stars, to rains of organic matter coming down on this earth, and he obviously enjoys pulling the legs of everyone trusting in "SCIENCE" as it is commonly understood. The books are valuable not only as a source of rare occurrences or, at least, reports, but also as masterly satires. In reading them with a mixture of admiration for the author's information and of amusement over his humorous cracks at all that is accepted on belief, we often had to think: "Is there any truth to these reports?" If there is, someone in the universe must have developed rocket planes before we did.

Burbank and The Scientists

An Introduction to the new book by Roger W. Smith

THE recent issue in the Gardener's Book Club, Roger W. Smith's study of Luther Burbank, brings to mind the fact that Burbank, in his own time, was by no means overlooked. On the contrary; he was written up extensively by leading botanists.

The author of the modern theory of heredity based on "Mutation", Professor Hugo de Vries, visited Burbank in California during the years 1904 and 1906. He lectured at the same time at the university of California, but spent several days on Burbank's grounds. In volume VI of his *Opera,* published 1920 in Utrecht, Holland, his impressions are collected in two articles, which had previously been issued as contributions to scientific journals. As a practical Hollander, he starts one of the essays with the computation of the Department of Agriculture that Burbank's potato increased the annual yield of the American potato crop by $17,000,000. De Vries was impressed especially with the great number of varieties that Luther Burbank bred at the same time on his relatively small piece of land. He emphasized that Burbank was rather casual in his pollen transfers and that the majority of his introductions were achieved by vegetative propagation. Scientifically most important seemed to the professor Burbank's well-known method of increasing the variability of plants by breeding extremes together, and by using great numbers from which to select.

How large a number of plants Burbank introduced to the trade was unknown until recently, when another scientist, W. L. Howard of the University of California issued Bulletin 691, entitled *Luther Burbank's Plant Contributions.* In the preface we see Burbank's unique blend of business enterprise and botanical interest, but the main part is a list of the known introductions of Burbank. There were seventeen blackberries, ten cherries, 124 different kinds of plums, eleven varieties of corn, and similar numbers of almost all the other fruits, berries, and garden crops. Burbank did not succeed as a businessman, but he left his stamp as a breeder. A fifth of the plum or prune varieties that he introduced are still widely planted. "In California alone, there are over 2,000,000 plum trees of his breeding." Thousands of carloads of fruit are shipped annually; and the money returns run into millions —not a bad showing for the industry of one man.

How was it done? You will find a lucid account of this work in the book by Roger Smith.

Hints for the Victory Gardener

"THOUSAND-HEADED CABBAGE" (Brussels Sprouts)

This is the thirty-seventh of a series of articles by this author dealing with the cultivation of ordinary vegetables.

By ROGER W. SMITH

DOUBTLESS no vegetable has been more "looked down upon" than the ordinary cabbage but if you become interested in this plant, as you probably will, you will find in its many forms much of interest. One of the most interesting forms of the original wild cabbage, a low, woody herb common to the chalky cliffs of western Europe, is the "thousand-headed cabbage."

Often a cabbage plant is thought of as a low, small plant developing a tight, ball-shaped head of leaves. The wild cabbage plant is loose-leafed, not unlike a radish in its foliage. It is a biennial, that is it bolts and goes to seed the second year after starting growth. Its leaves are tough and the plant would seem to offer no greater possibilities than many of our common weeds. Yet from it ancient and modern gardeners have developed all our many types of heading cabbages, cauliflower, broccoli—both white and green-sprouting—kale, collards, and brussels sprouts. At one time brussels sprouts were popularly known as "Thousand-headed cabbage."

Brussels sprouts, *Brassica oleracea gemmifera,* to be exact, has a peculiar and rather modern origin. It deserves a place in your garden even though its growth requires considerable garden space for the rather small amount of foodstuff produced. Eventually you may decide that the exquisite flavor of the fresh gathered, naturally grown sprouts was well worth the space and plant nutrients required.

To grow this plant successfully you might like to know just how it was developed, so that you will be better able to cause its "little cabbages" to form in profusion.

It is likely that originally this plant was much like the tall, forage type of cabbage at one time very common in Western Europe. Ten foot high cabbages of this type are still grown in the Channel Isles. Farther north because of the shorter days and cooler climate, it is probably that these tall plants formed more succulent leaves.

It is probable that the plants, grown in a garden, were protected from damage but that their foliage was gathered daily and used as feed for domestic animals, chickens, rabbits, perhaps for human consumption. This process must have gone on for a long time, and the plant struggled against it. Eventually, when a large leaf was cut off with a stub remaining, the plant swelled at the axil bud and formed a "little cabbage."

However this may be, you will find that if you cut off or break off, the lower leaves of each brussels sprouts plant when these are full grown, leaving a part of the leaf stem, the "sprout" will form at the point where the stub of leaf stem joined the main stem. The removed leaves may be added to the compost heap.

But before you either break off

the leaves or pick the sprouts you have to grow the plant. Seed of brussels sprouts looks much like ordinary cabbage seed. It should be sown in specially prepared seed beds shortly before midsummer allowing a wide margin to insure that the plants mature their crop before really hard frosts. This simply means that, suppose you sow seed of "Long Island Improved", you will have to

remember that it matures in about 120 days and sow the seed at least that many days ahead of the date the first heavy frost is scheduled for your locality.

You will, naturally, see that the seed bed is properly prepared. Its contents should be made up of a fifty-fifty mixture of good topsoil, well sifted, and mature compost humus. The addition of a quantity of pulverized limestone or chalk is likely to improve it.

If you go to work and improve the garden area where the plants are to grow while you wait for the seedlings to grow, you will save yourself a lot of trouble when you get ready to transplant the seedlings.

If the plants are to thrive and produce their crop of sprouts, they must have ideal soil conditions. When you transplant them, they are apt to be somewhat leggy plants about six inches high. The lower leaves should be pinched off and the plants given about the same care as fall cabbages.

Brussels sprouts are subject to the same moderate attacks of insect pests as fall cabbage, although plants grown in well drained, well limed soil properly enriched with plenty of organic humus are not too badly damaged by these things. Salt water will do much to check caterpillars, aphids, and the like, in fact you will find it well to remember that wild cabbage, the ancestor of brussels sprouts, thrived with its roots in a limestone soil and with the salty spray of the ocean waves misting the air about it.

If the plants are to thrive and produce a heavy crop of sprouts they must be luxuriant, they must find the soil rich in lime and organic matter, for they are gross feeders and the soil must be heavy with moisture-laden, natural organic matter. To insure soil fertility a heavy layer of compost humus should be lightly dug in over the area where the plants are to grow. If you are short on mature composted materials, raw materials will have to suffice. Brussels sprouts get along nicely upon partly broken down substances, such as raw manure. Properly made compost humus is, of course, better since it is more concentrated in its nutrients.

When the sprouts become one

inch in diameter they are fit to pick. If their picking is delayed they are likely to dry out. Compost grown plants should yield at least one quart of sprouts per plant. But careful treatment in the cutting of the leaves and picking of the crop often yields more. Skill in increasing the fertility of the soil by the use of compost and compost mulches, by watering with "compost water" or liquid manure, will often greatly increase the yield. Properly handled, between fifty and sixty plants will provide your family with all the sprouts they can eat over a long period.

At Thanksgiving time you wonder how you might store a large supply of the sprouts since you found them fine eating. To do this the plants should be pulled up bodily and placed in an upright position, close together in a cool cellar with a good ball of earth surrounding their roots. If kept moist and not allowed to dry out, even though kept in darkness, the plants will continue to form fine, fat buds in the higher leaf axils.

Perhaps, as you stack them together, you will remember only one other type of erect cabbage, the broccoli. In its leaf axil, the broccoli forms an edible flower bud. More than likely, you know that if these broccoli flower shoots are cut, with the scale leaves attached, and planted they will take root. You wonder about the "little cabbages".

What would happen if these were removed with a piece of the leaf stalk and the stem attached? If they struck root, what form would the resulting plant take? If you dug up the roots of some particularly fine brussels sprouts plant, one which produced exceptionally large sprouts, and overwintered it, would it run to seed the following year? What would the plant look like?

In its seedling stage you might have noticed that the brussels sprouts plant wasn't very different from the seedling of ordinary cabbage. As it grew, if you hadn't expected it, you might have been amazed to find the plant shooting up a long stem as if going to seed, have found satisfaction in its form, its large, rich leaves.

Your interest in this form of the cabbage plant may well serve as an excellent introduction to its many other and varied forms in the production of which mankind has depended long for bare subsistence.

The Organic Age

OUR CORRESPONDENT Mr. *Henry Haas of New York* made a very acute observation on growing plants in water culture. This system, he says correctly, was probably the first when the earth obtained its early vegetation. The earliest plants did not find a rich layer of organics and had to rely on soil minerals in water solution. As the earth's green mantle developed and decayed, we passed the hydroponic aeon and entered the organic age. While hydroponics are very good for ascertaining plant needs in the laboratory, they are for all practical purposes, except the growing of expensive florist's stock, not only precarious, but far too costly.: Why set up complicated machinery when we have the good earth to rely upon?

Farming 750 Acres Without Artificial Fertilizers

Condensed version of an address arranged by the County Palatine of Chester (England) Local Medical and Panel Committees, in conjunction with the Cheshire War Agricultural Committee, The Technical Development Committee and the Cheshire County Branch of the National Farmers' Union.

By Mr. FRIEND SYKES

Mr. Friend Sykes

Mr. Chairman, Ladies and Gentlemen,

Before I begin my Address this evening, I would like to dwell for one moment only on a personal point. My name, as you have seen from the Notice you have received, is Friend Sykes. I want to make it quite clear that it is not Frank Sykes. Mr. Frank Sykes is a farmer in my own County. He and I are getting dangerously mixed up with one another; he is an author; I too am an author. We both speak on agricultural subjects and the confusion which exists is quite embarrassing so that we have agreed one with the other that wherever we are in public we will take some steps to make our identity known. Well, having—and I hope without offence—successfully established no connection with the firm opposite I will get on to the subject of my address this evening.

I sometimes wonder why it has been allotted to me to be called upon as I have been during the past winter to address some thirty large meetings of farmers throughout Britain, because I really have no qualifications to address you at all. I am, I think, a very unscientific farmer. By an unscientific farmer I mean this, that if your idea of the really efficient farmer is a young man who bears a B.Sc. degree and who, with a vigorous step, walks round the farm from day to day with a test tube in one hand and a cheque book in the other, then I am not that type of scientific farmer. I farm very much as my great grandfather farmer before me. I am a man who has believed all my life in muck. During the more recent times I have learned more of the virtues of muck. I have also learned some of its disadvantages and to-day, with certain treatments that I have applied to my muck, I have got my farm to such a point that I have been able for some time now to dispense entirely with the use of artificial manures. In case some of you may be under a misapprehension that I am not farming like the rest of you I want to tell you all that I am a working farmer. I have to knock a living out of the land. It is of the greatest importance to me that I should

farm for a profit, and I have got the making of compost and the use of muck to-day to such a practical proposition on my holding, that I am able to tell you, so far as I am concerned, that it is a very much more profitable system than when I used artificial fertilizers. I think I cannot do better than very briefly tell you the story of my farming. It is a story of successes; it is equally a story of many failures; and because of its human composition it naturally makes a very human story. It goes back now for nearly 32 years. Originally I began with dairy farming and the keeping of Berkshire pedigree pigs. The stock that I went in for 30 years ago was a breed of cattle very familiar to you Cheshire Farmers—black and white British Friesians. I established in those days one of the best herds of Friesians existing in the country. I had a champion cow which gave 6,600 gallons of milk with the first three calves and butter fat to the extent of 4%, which I showed at the Royal Show. I had a good class of stock; we won the Mattbar Gold Cup and a number of other trophies. I mention these successes to prepare you for the failures which I am going to relate. When the first Accredited Milk Scheme came into being we were asked; as one of the leading dairy people in the county, to show the way to other stock breeders by joining in the scheme for tuberculin-tested cattle. I was then 30 years younger than I am now and quite sure of myself. At 60 years one is not quite so sure; but we went in for this scheme and were surprised when we got the returns that 66 per cent of those cattle were reactors. If that was the condition of the best herd of cattle in the County, what must have been the T. B. condition of the remainder. That gave us a lot of food for thought, and we consulted many authorities, every leading veterinary surgeon that I could get to know, and I came to the conclusion, rightly or wrongly, that we were overdoing the milk production. I began to realize that a cow was not a machine; that these heavy milk yields were the chief causes of loss of health in my cattle, and after a great deal of study, I decided to reverse the whole of my policy and instead of going in for big milk yield I decided to feed the cows normally on food entirely grown on the farm and be content with the yields of milk that nature itself would provide without too much stimulation. There were some other activities indulged in to bring about these results and they were in connection with the cultivation of the land. I began to diminish the use of artificial fertilizers. I was simply trying to explore and discover a method of growing a healthier stock of cattle that could resist the onslaughts of disease if it came along.

I decided to leave my old farm which was in Buckinghamshire and go on to my present farm which I bought freehold for £4 an acre. Chalk is required to grow that close texture of bone which is found in the racehorse, so I went to my present holding purely and simply for the benefit of those stock. I bought about the most derelict piece of country that one could find anywhere. I had to spend £1,000 in rabbit wire and every year I killed from two to three thousand rabbits and still kill hundreds a year. The soil fertility at that time was so poor that the fifty head of dairy stock which I took to the place could not live without artificial feeding. The grass was very poor and there was nothing left for me to do but to augment the sup-

plies from outside. I went in for organic farming. I bought a portable milking bail, on its four wheels, which is dragged round the farm, and the cattle follow round, and in that way I brought organic fertility into the ground in a way which has surprised even me. Up to the time I went to Chute I had been a half-and-half man who liked muck and I used to be a fairly heavy buyer of artificial fertilizers, but when I went into this high land, and so far as this farm was concerned, I decided that we must get out of artificial fertilizers altogether. On my old farm I do not suppose I ever grew more than six quarters of wheat an acre. Last year I had 90 acres of wheat. Now I do not suggest for a minute that 9 quarters are going to startle a Cheshire farmer, which is what I grew, but to us farmers in Wiltshire 9 quarters is not thought too bad. What surprised me most, however, was the fact that with the increased yields this went hand in hand with better quality of produce, and whereas 9 years ago I had an artificial feeding bill of £80 a month. I have to-day 250 head of cattle on this place with no feeding bill at all. I have discovered that quantity, when produced by humus alone runs hand in glove with quality. I am quite satisfied from my own farming experience that quality did not go hand in glove with the use of artificials. The food itself had not the same life-giving qualities and as this meeting progresses I hope that questions will be asked to enable me to give evidence on any point that you would like to bring out. As time went on I came face to face with another difficulty and that is with war-time ploughing, I was accumulating some 40 to 50 ricks of straw from my corn crops. This had to be turned back into muck; but not muck only. I was determined to make it into compost. Rid the muck of the weeds and purify it from the possibilities of disease. When I was making 500 tons of compost a year it got to a point that my men were very troublesome and one day they came to me after they had been working for five or six weeks, all wet, with leaking rubber boots. They put their thumbs into their waistcoats and spoke to me in a language which people in Cheshire would not understand. I was up against a difficulty and told them to go into the barn and find something else to do and I sat down and designed a machine. In a few days' time I went to a firm of machiney makers who said "You have invented something, Mr. Sykes. We think we can make some contribution towards its efficiency with regard to the manufacturing of it if you wish." That led me into an engineering undertaking. I want to mention that invention for two reasons—(one) because of composting on a large scale; (two) because muck-making is an unpopular job on the farm. I do not think you need telling how valuable it is to get the muck back on to the land. You are all using artificials because it is the most convenient method; you are not using them because they are the best methods; you have no alternative and further because you have not the men to do the work. We have all done it, but we hope that better times will come; we hope that better times are coming and, when we realize the possibility of those better times, I submit that we all know our responsibility as farmers and we are going to determine to farm well and you cannot farm well without muck, not even if you use artificials. Since designing this machine several others have been in-

vented by other people. I have reduced my compost making from 14s. a ton to 4s. a ton; I have increased my tonnage to such an extent that I shall have made at least fifteen hundred tons of compost—two men doing an easy job instead of the whole farm doing a hard job. There are two methods by which a farmer can make compost. One is the Indore process invented by Sir Albert Howard, where a layer of straw is put down, 4in. of dung, sprinkling of soil, copious water; another layer of straw, 4in. dung, another sprinkling of soil, 15 feet wide, and as long as you like to make it. Build up in that way and within three days that heap rises in temperature to 140° F. When you assemble that heap it smells and is full of flies. Within three or four days the smell is entirely gone and you have from then onwards a clean and a very pleasant substance to deal with. In three weeks' time that heap needs turning; watering again is called for and in three weeks' time we turn it yet again, and then it is left for a further period of six weeks at the end of which time it is pure humus which resembles the decomposed vegetable matter and does not smell at all; but is a re-fertilizer that will act more dramatically than any application of any fertilizers which have ever been put on the land, and its effects will be there for years. This admission may not be new to some of you; but I suggest to you all that unless you have had experience of re-fertilization with compost there is not any one of you who knows what a wonderful re-fertilizer compost really is. Furthermore, you have had the satisfaction of knowing that every time you put a dressing of 10 tons of this material to the acre you are building up fertility in your land. You are not exhausting your fertility; with applications of fertilizers you are always exhausting fertility. You have got to apply the artificials every year, and in a few years' time you find yourselves doubling their weight.

DISCUSSION

(*About 500 Farmers were present*).

The discussion that followed was animated and interesting and although the tendency of the participants generally was to express opinions in preference to asking questions, the further statements and answers of Mr. Friend Sykes added to, rather than detracted from, the principles and practice which he had so successfully outlined in his address.

On the subject of proof as to the relative value to land and stock of compost on the one hand, and on the other of artificial fertilizers, Mr. Friend Sykes said, in reply to Mr. J. A. Duncan, of Landican (Vice-Chairman, County N. F. U., and Chairman of the Technical Development Committee) that, although conclusive scientific proof may be thought to be wanting, it was equally true to say that there was no disproof of the relative superiority of the compost system of soil fertilization as witnessed by the successful results of his own practical application of the system to his own poor land which was richer in fertility, greater in productivity and healthier, both with regard to crops and stock. For some considerable time past, efforts had been made—so far without success—to induce the Government to carry out a long-term series of comparative tests. He had suggested the manner in which they could be carried out and he hoped that something would be done in this direction in the near future. The pros-

pect of Government action was much more rosy than it had been in the past.

Dr. Walker, Manchester University, speaking as an agricultural scientist, said he had searched in vain for evidence that crops grown with artificials were inferior to those raised with compost. Analyses for mineral and vitamin content revealed no difference. He agreed with Mr. Sykes, however, that the Government should embark on experiments. *

Mr. Sykes in reply said that although scientists could find no difference between crops produced with artificials and those raised with compost, the cow knew the difference, for when the cattle were placed in a field, part of which had been treated with artificials and the other by compost, the latter was grazed down to the ground whilst the former was left untouched. The question was to a much greater degree than was generally or scientifically understood, one of the biological differences.

A great deal was heard about alleged deficiency of phosphates. Mr. Sykes' answer was—farm with compost and you can forget about phosphates.

Dr. Picton enquired how the balance of phosphatic content of the land could be restored if so much is taken away in milk and the other exports from the land.

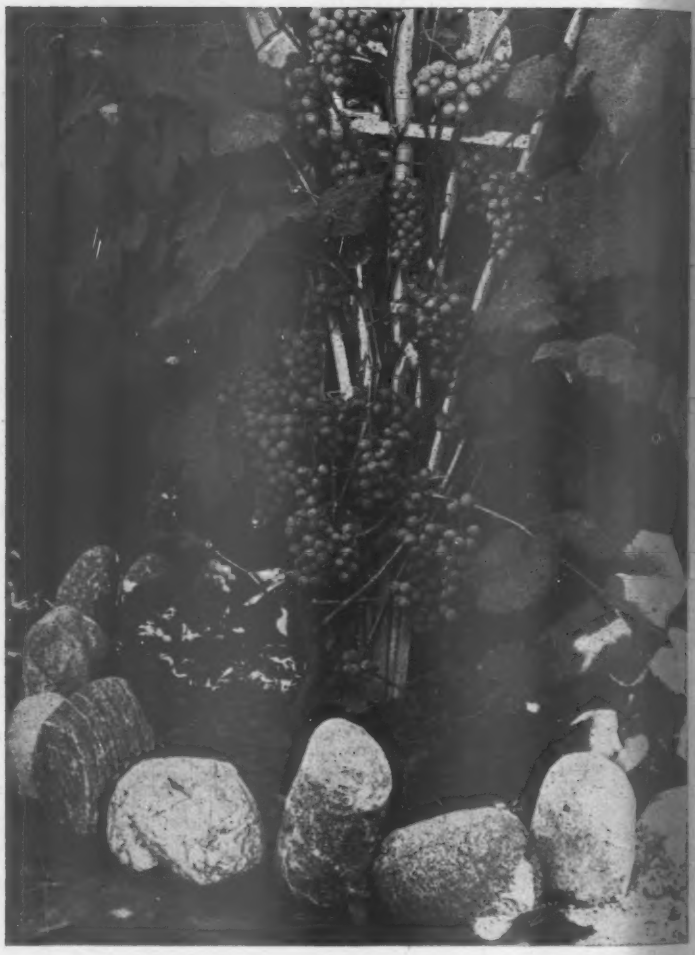
Mr. Sykes said that the restoration of phosphates could be secured by returning to the land as much muck and straw waste as you can, with the services of the earthworm; this would create a phosphatic content far in excess of what was taken away. The land, with stock upon it, subsoiled the four years' pasture. All these acts combined would maintain phosphatic content of the soil.

Mr. Sykes gave an interesting account of the practical application of the compost system to the growing of tomatoes in the district of Worthing which had responded extraordinarily well to this particular form of treatment and had very largely superseded in that district the recognized prescription sulphate of ammonia, superphosphate and potash.

Other questions dealt with by Mr. Sykes were as to how he could find the requisite quantity of straw and other vegetable matter to mix with his muck to make the compost required for his farm, having regard to the poorness of the land. Would the results be as highly satisfactory in Cheshire where land was generally of good standard as they were in his county where it was admitted the land was poor and normally unproductive? Why were earthworms beneficial and slugs a menace to the land?

The discussion was followed by a film showing the compost-making machine in action, together with pictures of a hayfield where the crop was so dense that the tractor mower could only with difficulty get through it.

*EDITOR'S NOTE: Dr. Walker has not searched far enough. There are several cases on record where tests, made under scientific auspices, showed organically produced food to be superior in vitamin content. See Pay Dirt (Devin Adair Co., N. Y.). The error that the average agricultural scientist makes is that he considers the use of animal manures to be the organic method. This is not quite correct. In such a method, a well-balanced compost must be used, consisting of 3 times as much green matter as manure.



Herbert Clarence White of Gardena, California, sent in this beautiful picture of a perfect Golden Muscat grape, planted in April 1944, mulched with straw and leaves October 1944, April 1945, and August 1945. No poisonous sprays or commercial fertilizers were used.

Mr. White's family seem to enjoy the grapes and the delight is intelligible: The first year after planting, this vine produced forty-five bunches of grapes of unexcelled size and quality.

Sheet Composting

By JOHN ANDERSON

WHILE we read more and more about "farming without synthetic fertilizers", the large operator is always wondering how he can possibly make enough compost for a hundred-acre orchard or a two-hundred acre farm. It has been done, with the help of the proper machinery, especially the manure loaders of various design, but it has been done only when a diversified enterprise was involved. Where there are no animals, there will be no manure; and where there is no manure, you cannot profitably make large amounts of compost. A farm or any other extended gardening or orcharding project cannot be put on an organic basis without animal manures. No doubt, in the small garden there are substitutes, such as dried blood, bone meal, hoof and horn meal, but to apply these costly materials on hundreds of acres would be prohibitive if the enterprise is run commercially.

Some people have made much of cover crops. It must not be forgotten that these serve frequently also as "green manure crops", as they are plowed under and allowed to decay in the ground. Nevertheless, where nothing else is added and where the major crops are sold off the land, a deficiency is bound to develop, even though the green manure crops can be so designed as to cut down on losses in the soil. It must also be remembered that animal manure adds not only a rich variety of bacteria, but also valuable hormones necessary for healthy plant growth.

The main green manure crops are legumes: Peas and vetches, clovers and alfalfa, and many more commonly used in different parts of the country. These are gatherers of nitrogen. While they use nitrogen in the soil for their growth, they derive, when the appropriate bacteria are present in the ground, more nitrogen from the air. As they are finally plowed under this air-gathered nitrogen becomes part of the soil and a plant food for succeeding crops. It must, however, not be overlooked that a cover-crop of short duration, let us assume, of a few months growth, is not capable to gather great amounts of nitrogen. The real benefit of the nitrogen gatherers is derived only when these crops are used in a regular rotation, when clover, for example, or alfalfa occupy the land for longer periods. There is naturally always the tendency to harvest these crops for feeding purposes or even to sell them outright to feed mills, in which case the full benefit of their fertilizing work is not obtained.

The method of "sheet composting" is a step beyond the system of green manuring, in that it combines the benefits of composting with the benefits of a green manure crop in the rotation. When you recall the steps in compost-making, you first place six inches of green matter on the ground, then add two inches of animal manure. This is

the proper ratio of carbon materials or energy food and nitrogenous materials or growth food. When these two substances are properly balanced and when care is taken that enough bacteria can work on the mixture, that is, when rich earth is sprinkled on the layers and when some wood ashes or limestone are added to prevent acidity, the soil gets in the end a balanced food in which the microbes will work and the roots forage; healthy plants, healthful crops result. In "sheet composting" the same process is followed on a larger scale.

The green manure crop is dressed with finished compost or fresh animal manure. In the latter case, the best method is to apply about one part of stable manure to three parts of green matter. When the green matter consists of a young growth of a legume crop, a smaller amount of stable manure will still bring good results, since the legumes contain nitrogen. Incidentally, a golden rule is this: The older the growth of the cover crop, the less rich in nitrogen. Consequently, the older your green manure crop, the more animal manure should be added.

Where the soil needs liming or is deficient in magnesium and phosphorus the necessary materials—limestone, dolomitic limestone or dolomite, or rock phosphate finely ground—should be added at the time of planting the green manure crop. This simplifies later operations besides stimulating the growth of the legumes.

When you then turn under green matter and the manure layer in a soil previously put into the proper condition, these substances will immediately commence to disintegrate through the action of soil bacteria. It is, of course, also well known that these organic substances offer food to the earthworms. They feast on the decaying material and convert it more and more into humus.

Wherever a large farm is soundly diversified and has enough animals to keep up the food balance, sheet composting is the easiest and simplest approach to organic fertility. It is not so good as the use of finished plant food by supplying mature compost. But it is the next best method. If specialization has gone so far as to exclude pastures and animal keeping, organic methods are not only difficult to practice, but costly. And I mean by this, not only costly in money, but costly to the soil and its sustained fertility. For try as you may, plants cannot be successfully grown without humus, without organic material in the soil; if you do not add these, you may ride along for a few years or a decade, stimulating your crops artificially, but the humus content gradually becomes depleted, your soil becomes packed and baked, the plant food becomes unavailable, water runs off and takes the top soil off, while air cannot penetrate to the roots, and your yields go down. The plants tell in very emphatic language that you have abused your land. There will be the "quick decline", of which the citrus growers are now talking and which they hope to doctor by artificial feeding methods; there will be increased diseases and pests to which poorly nourished plants are no longer resistant; and there will be erosion that not only ruins your land, but our land, the land, land on which we all live, land which we hope to preserve for future generations. If you deviate from nature's rule and fail to keep up proper organic balances, your land cannot be redeemed over-night.

I was taught by my father that "you cannot take your money with

you". If diversified farming, farming with animals and pastures, does not produce those quick incomes of specialized enterprises, it also does not create the risks of specialization; but above all, it does not make inroads into the capital investment, it does not deplete your property, but enrich it. A little smaller cash income, but a good conscience; a somewhat greater variety of tasks, hut the pleasant enjoyment of a real farm with animals and meadows; a somewhat more natural approach to fertility, but the knowledge of doing the right thing will be yours. The right thing, the only scientific thing is the addition of humus material. It is strange that so many would-be experts overlook this simple fact when they suggest that we add all sorts of easily soluble synthetic chemicals. There is not a single reliable experience, not one extended experiment that would show that we can get along without humus in the soil. Sheet Composting is a safe method of adding it.

English Compost Controversies

THE COMPOST SCHOOL, headed by Sir Albert Howard, is making steady gains in England. Naturally, there are conservatives who do not want to accept the findings that disagree with their preconceived notions on the adequacy of synthetics. Among these, E. J. Salisbury, Director of Kew Gardens, a fine botanist, but not exactly an expert on agriculture or soil biology, came out very strongly in the *Journal of the Royal Horticultural Society* (October, 1944) against organics and humus. In all such discussions, the opposing side is always attacked as not being sufficiently trained in science. It is therefore interesting to note that the experts in the British *Ministry of Agriculture Weekly News Service* are beginning to take the humus method more seriously. In No. 308 they say: "Soil has a life of its own, and the maintenance of fertility is not purely a matter of keeping up the concentration of certain chemicals. Certain organisms acting on the organic matter in the soil play an important part in the making of humus." Thus they come to the conclusion that we need more information and further knowledge. We do not know as much as Dr. Salisbury seems to assume. And thus, between back and forth, pro and contra, the truth will gradually evolve more clearly if we all keep on working—without bias.

Storage of Wheat

ORGANIC GARDENING FARM EXPERIENCES

IT is a common practice of farmers and millers to protect grain crops against infestations of weevils by fumigation with chemicals. As organic farmers we are opposed to this method and have developed a system, suitable to the average-sized enterprise, to get along without chemicals.

As long as you have a granary that is sufficiently mouse-proof, your first and greatest difficulty is overcome. By placing fine-mesh wire all around the storage room and having a tight fitting door, you can keep all rodents out.

The next trouble, and this is the major problem in most regions, comes from fungi which cover grains and seeds with their mouldy growths. There is nothing to be done except thorough drying, repeated shoveling of piles, and adequate flow of air. Especially with seeds, such as corn and sunflower, this is necessary. Proper air circulation is needed even where chemicals are applied, unless you want to get shriveled or spoilt grain to contend with.

Weevils and all insect-born pests arrive invariably when immature grain is stored before it is dry throughout. As everyone knows from the compost heap, green matter heats up readily when piled in heaps. Immature grain is close enough to green matter to heat in this manner. Then the breeding conditions for insects are created. We have developed a system that is used in a similar form in Holland for the storage of seed potatoes. By it, heating is made impossible. We made boxes, which have inserted in their bottoms a piece of fine wire

mesh. When these boxes were filled with dry grain or seeds no trouble of insect infestation ever arose. It is our practice to stock these boxes in such a way that air can circulate freely. The second box is set over the first at such an angle that an air space remains at the corners, then the third box is set up at a level with the first, and so forth.

When we first started organic farming and decided to get along without fumigants, we developed this method. We made the boxes small to be on the safe side and to be sure that enough air would circulate. In the meantime, we have built our granary where we store chicken feed and sunflower seeds. Here we have larger boxes, set on the floor, containing several hundred pounds of seeds each. The floors have a large piece of fine mesh inserted, under which braces support the weight. No moulds have ever appeared and no undesirable heating has taken place. In the moist conditions of the Lehigh Valley many farmers have had trouble with grain storage; we have not.

The picture shows the size of the original boxes. The dog and the man are connected biochemically by the fact that Dalmatian dogs are the only animals that have one thing in common with humans, they secrete allantoine in their urine. We have better pictures of the Assistant Editor than this stooping likeness to Dr. Meyer but we have no better likeness of our storage bins.

Fluorine and Good Teeth

TRISTAN DA CUNHA was frequently mentioned because its population has p a r t i c u l a r l y good health. Among the inhabitants there is also an overwhelming number with excellent teeth. But about fifteen out of a hundred have mottled enamel. This indicates, as we now know, the influence of fluorine. Fluorine is essential for the formation of strong enamel, but when in excess, as in Colorado Springs or Bauxite, Arkansas, the teeth become covered with a brown stain. While formerly it was said that the teeth once formed could not be affected much by changes in diet or by the addition of minerals to the drinking water, it is now known that people with soft enamel, subject to easy decay can build up a considerable resistance so that the dentists wonder about the feasibility of adding fluorides to municipal water supplies. Those interested in the research along these lines will find information in *Fluorine. A Symposium*, New York Institute of Clinical Oral Pathology, 101 East 79, New York 21. The organic gardener who uses bone meal is apt to get his fluorine requirements in his own garden from his home-grown vegetables.

Potting Plants

WINTER is the time for potted plants. How many suitable flowers there are available can hardly be surmised. Nevertheless, most of the plants growing in the Northern Hemisphere require naturally a rest period during the winter months, and unless special greenhouse facilities are available you cannot have Fuchsias flowering around Christmas. But by anticipating the rest period in delaying growth earlier in the year, you can have many flowering plants in your window gardens. The hyacinth is a good example.

How about vegetables? Chives, a very delicate and useful kitchen vegetable or herb, will not winter in the open. If you take out a clump and place it in rich organic soil in the pot, you may have fresh greens all through the winter. You may

likewise have parsley for cutting if you keep the pots in cool rooms or porches.

Naturally, you will take some Chrysanthemums in, place some carnation cuttings in pots, have your cacti ready for inside culture as soon as the cold blasts drive down from the North, and you may even experiment with tomatoes, numerous vines, and annual flowers if you have a suitable place.

Now what is a suitable place? The temperature must not be above 60 degrees (Fahrenheit), the room must not be too dry, and good light must be available. Some slow-growing plants, like cacti, which have above all a rest period during winter, must be sparingly watered, if at all; for when no growth is made, very little water is used. On the other hand, if you have a Salpiglossis inside, perhaps made from a cutting, and it grows well, you must give it some water. Many gardeners like to turn their pots so that the plants do not bend toward the light, but that all sides get light; however, this invariably requires adjustments in the plant and retards growth to some extent.

Concerning the pots, they must be scrubbed clean before you fill them. They must not be too small for the roots, but they should not be too large either; a smaller pot produces quicker flowering, while adequate nourishment in a large pot allows the plant to make more of a vegetative growth and to delay flowering. The best practice in the greenhouse is unfortunately not always suitable to the window gardener: Repeated repotting from 2-inch to three-inch, etc. pots. If you can do this, you must have a cellar

in which you have an ample supply of potting earth ready.

While the glazed pots inhibit aeration, they may, if not overwatered, be quite suitable, because they also check evaporation and chilling of roots. In an average clay or terra cotta pot, the roots go toward the outside wall in search of air, and as the water evaporates there through the walls, a cool region is created. In special cases with valuable plants, such as expensive cacti, this can be remedied by setting the smaller clay pot in a bigger one and filling the space between with sand.

These are but a few practical suggestions. More details will be brought out in future articles. M.

Hormones and Fruit Drop

WHEN THE NEW hormones are sprayed on trees for the purpose of keeping the ripe fruit from dropping "prematurely", one of the natural actions of the tree is chemically suspended. Is it good for the tree in the long run? So far nothing is definitely known. But it is known that in the case of Bartlett Pears these sprays proved a two-edged sword. Pears did not drop, true enough, and the picking season could be extended during the labor shortages; but the pears became over-ripe and rotted more quickly after harvesting. The fact is that these sprays not only delay dropping, but also quicken the ripening of the fruit, so that the picking season may become actually shorter than when no sprays are used. This is not a speculation by an outsider, but the result of several years of study, published as Bulletin 692 of the Agricultural Experiment Station in Berkeley, Cal., under the title: *Hormone Sprays and their Effect upon the Keeping Quality of Bartlett Pears*, written by Allen and Davey. Man simply cannot interfere with natural processes without creating disturbances.

The Pumpkin

By H. K. MEYER

WINTER is the time for pumpkin pie. Now that whipped cream is again available, our old favorite American dish will make its reappearance on the well-bedecked table. And pumpkin is a truly American fruit. The oldest agricultural people on the North American continent, the so-called basket makers, and the next group, the cliff dwellers, grew pumpkins. Their original home is somewhere in Central America or in the Northern tip of South America. For pumpkins are, as every gardener knows, hot weather crops that can be successfully grown in the North only when great care is taken with the seedlings. Some common pumpkin varieties were already well established before the Revolutionary War, and the colonial settlers knew, for example, of Large Cheese and Connecticut Field Pumpkin.

Pumpkin pie seems a typical American institution vying with mince pie for favorite honors on our winter menues. And pumpkin-growing has always been a favorite pastime for exhibitionist gardeners. Nothing used to create such a sensation as the display of a gigantic fruit which surpassed the efforts of the competition. And, as for the youngsters, we need not even mention Halloween to point out the time-honored importance of this fruit.

The word *pumpkin* derives, as so many English words, from an old French word *pompion*, which itself comes from the Latin word *pepo*, which signified among the ancients a melon. Indeed, the old English writer Elyot speaks of "a kind of melones called pompones." The word *pompon* was more used before 1600 than the present form pumpkin. Amusingly enough, the first reference to pumpkin is "our pumpkin blasted brains", which somewhat reminds us of pumpkin-heads.

While the philology of pumpkin is thus very simple, the botany is rather involved. In 1929, A. T. Erwin of the Iowa Agricultural Experiment Station, tried to bring order into the mix-up of names and confusion of terms by suggesting that English usage follow botanical classification, but to date nobody has followed his suggestion. The trouble is this: Pumpkins and Squashes are very closely related, so closely in fact that many a gardener has asked whether the two would not cross. As a matter of record, they do but rarely; not often enough, at least, to cause serious concern.

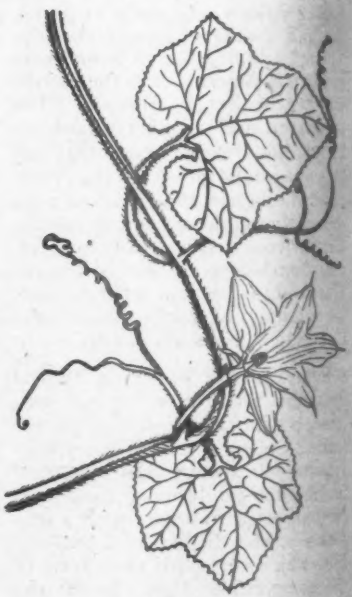
Botanically, we have the following set-up. There is a large family called cucurbits, to which cucumbers, water melons, cantaloupes, melons, and all sorts of gourds belong. In this family, a group, the genus *Cucurbita* has closer relationship. Like the other cucurbits, this

genius first sends forth an abundance of male flowers, followed thereafter by the female flowers, easily

Female flower

seen and recognized by greater size and beauty and the ovary below, which becomes in the end the fruit. In this *Cucurbita* family we have three species, with the given names *Pepo, Moschata,* and *Maxima.* All three of these have twenty die-body or chromosome pairs when inspected under the microscope. This, at least, shows that Pepo is a brother of the Moschata and Maxima. So far, so good. But now you look at this simple family of three from the side of the English names.

We have the common field pumpkins (Pepo), we have a twin of his, which didn't quite develop to its size (var. *condensa*) and which is called Summer Squash, and another twin (*ovifera*) which is called ornamental Gourd. Winter crookneck squash and cushaw squash are, on the other hand, members of the Moschata species. Just the same, their fruits are often sold as pumpkins, even as sweet potato pumpkins, Quaker Pie pumpkins, and Japanese Pie pumpkins. The gardener knows of course, that not all winter squashes are crookneck, and, indeed, the real autumn or winter squashes, like Hubbard, Boston Marrow, Mammoth Chile, and the really big ones which the exhibitors call "pumpkins", without a qualm over the confusion in botanical names, are members of the third species, Maxima. In other words, there remains a hopeless confusion about squash and pumpkins.



Male flower

If you see a fruit lying on a shelf and want to determine which species it belongs to, there is one

sure method, which we illustrate. Pepo or field pumpkin has a stem with five angles, which does not expand near the fruit. Maxima often called pumpkin, has a stem without angles, but fleshy and somewhat thicker where it holds the fruit. Moschata on the other hand has a thin stem, not angled, but much expanded where the fruit comes out.

which became the Golden Hubbard. In the last two decades, some Experiment Stations have gone into breeding better varieties by inbreeding existing strains and crossing or selecting them with scientific care. Chance crosses were again responsible for better varieties, and the Buttercup squash resulted from such a play of nature.

Pepo Mochata Maxima

Even though these different species do not seem to hybridize much in nature, though their close relationship would lead us to expect the contrary, a separate strain or variety in anyone species is hard to keep pure. The Hubbard has been known for about a hundred and fifty years, but it is hard to say how millions of bees have behaved and whether a hubbard squash today is really the same as the one originally so named. Marblehead was introduced, it is believed, from the West Indies in 1865, but what changes it may since have undergone is unknown. In the last fifty years, a number of new introductions were made, for example, Pikes Peak, Des Moines (Table Queen) and Fordhook. The latter was originated by Burpee back in 1889. A few years later. Mr. Harrison of Painesville, Ohio, went through his fields and saw an unusual Hubbard squash, which he picked out, and

Having looked at the history and botany of this interesting group, we might as well now investigate their chemical make-up. A recent article by Culpepper and Moon of the U.S. Bureau of Plant Industry comes to our aid. These two scientists made extended investigations with young fruits, mature fruits, and stored ones over a period of years, and then reported in the *Journal of Agricultural Research* (August, 1945) about their findings under the title: *Differences in the Composition of the Fruits of CUCURBITA varieties at different Ages in Relation to Culinary Use.* Their article comprises twenty-six pages and only some major results can here be adduced. The most astounding thing is this: When they analysed the fruits for sugar content, they found Mammoth Whale not only the most watery, but containing less than half the sugar of Table Queen. Connecticut Field

had just as little sugar as Mammoth Whale, and at the same time was very low in protein. Taking the varieties with the highest sugar content, we have in order the following: Table Queen, Fordhook, Sibley, Iron Bark, Winnebago, Chicago Warted Hubbard, Delicious, and Blue Hubbard. As the fruits mature and are stored, these varieties outdistance the others considerably, since fruits originally low in sugar do not develop much more when they go into storage. Those who would grow a Pepo rich in sweetness and therefore nutritional elements had therefore best pick Table Queen and Fordhook, those interested in Maxima had better use Improved Hubbard than Mammoth Chile. Incidentally, the scientists found that, the bigger the fruit, the less solids it contained proportionally. On the other hand, the housewife would rightly point out that she is not a chemist and that she will pare off a great deal more from five small fruits than from one big one, so that for practical considerations the loss may be the same. But what about color, flavor, and proper consistency?

For beauty of golden color, Golden Delicious, Boston Marrow, and Golden Hubbard stood out. The consistency was measured with a special device, Delicious heading the list, King of the Mammoths being the thinnest, Boston Marrow and Fordhook holding the middle. In flavor, of course, much depended on the scientist who tasted the product and whether it was meant for pies or not. A strongly flavored product does not matter when cinnamon and nutmeg add zest to it. The older the fruit, the stronger was its characteristic pumpkin taste; the more sugar it contained, the more pleasing it appeared to the tasters. Among the Pepo group, Table Queen and Fordhook were fairly mild in flavor, while Winter Luxury and New England Pie were rather strong. The Maxima varieties were generally mild, while among the Moschata species Large Cheese and Mammoth Golden Cuschaw were rated agreeable when used in pies.

Undoubtedly, the canners manage to produce a blend of flavors that appeal to a wide variety of tastes. But when you do your own canning of home-grown "pumpkins", you can always make the whipped cream layer twice as thick, and the family will not complain, whatever the variety of cucurbita below may rate.

The Health Page

ORGANIC GARDENING and HEALTH

OUR entire magazine is devoted to the growing of healthy crops which, therefore, will bring health to the wise who know how to preserve these exceptional minerals and vitamins for their daily diet. I have no doubt whatsoever that everyone can gradually free himself from small and even serious illnesses, many of which are connected with food deficiencies, by eating organically grown vegetables and by using grains in the fullness of their nutritive value. I am absolutely convinced that in time we may add years or perhaps decades to our lives by living the sound way of nature.

But this page will henceforth be devoted to special health problems, and the readers are invited to send in their contributions and experiences. When we consider, for instance, all the values that modern medicine has found in fungi, how penicillium and other substances are extracted from molds, we wonder if eating mushrooms would not greatly benefit our systems. Mushrooms have been an age-long staple of the diet. They are collected in many countries and sold in fresh or dried form for delicious soups, stews, and sauces. In this country, a great industry of specialized mushroom growers makes good mushrooms available in both fresh and canned state. These are all of one variety and free from insect ravages that mushrooms in the open must contend with. Any information about Health from Mushrooms will be welcome. For few plants feed like mushrooms, directly from the richness of organic substance. In this connection, attention is called to the article of H. K. Meyer on *Compost and Fungi.*

If you consider that mushrooms are the one crop that is entirely grown with organics, it would be indeed surprising that they should not have peculiar health-giving significance. No chemicals are absorbed into their systems. It used to be commonly said in books by dieticians that mushrooms had but little food value. Since the importance of mushrooms has been better recognized now, when molds and fungi have contributed to medicine so many valuable helps, especially penicillium, we hear but rarely any derogatory remarks on this ancient food. It may not be high in calories, but if it is high in certain minerals or if it has a biological significance such as we can now rightly assume, it may be a wonderful food and important for our health.

One health aspect that Organic Gardeners must never overlook is psychological rather than directly physical. Our mind and spirit are closely tied in with the successful operation of the rest of our organism. A phychological benefit is, therefore, just as important as a direct nutritive advantage. I once asked a Doctor friend of mine whether he believed that there was a "will to live", and he assured me that half of a patient's recovery was the patient's desire to get well.

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Only when a sick person gives up, only when the patient loses hope and decides that he might just as well die, only then a disease becomes serious. The patient then omits to rally all of his vital forces for the purpose of recovery. By the same token, all psychological benefits add to our physical well-being.

Among the things an Organic Gardener sees with joy is, for instance, the wonderful working of harmonious nature: How all living organisms go hand in hand and produce a balance that lets each one succeed. As you watch your flowers growing, as you weed between your celeries and tomatoes, you come in touch with nature's desire to cover the earth. An humble weed may be a lesson to the good gardener: There was an empty spot, there was light and air and moisture for one growth, and nature stepped in and filled the space. Or you observe your flowers, vying with one another in shapes and color combinations. Think how many different forms a tulip flower may have, watch for the fine shadings and blends of their colorful stately petals. But also consider how their bulbs reflect their innate color schemes. Dark purplish, so-called blue, tulips have a purplish skin around their bulbs while the lighter shades, the yellow-flowered plants, have yellow skins on their bulbs. Thus one law goes through all of nature. Even onions vary from white to yellow to purplish-red. These differences in pigment must signify a difference in composition. Maybe, the different colors signify differences also in food values?

As you spade and work in your garden, as you sow and plant and

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weed and water, your mind is taken off the troubles that otherwise might burden you. You yourself become balanced as you partake of the balance in nature. Naturally, your muscular system also gets toned up; your digestion is improved; you develop your physical well-being. How often have we received letters from men or women in their eighties and over, who are still gardening with zest, who are still making compost, and who are obviously in full command of a vigorous balanced mind, eager to learn and eager to keep up with what we are doing! When they walk through their gardens, watching the beauty and health of their flowers and vegetables around them, they can look at it not only as the work of nature, but as part of their own creation. This is the supreme satisfaction of the gardener. In this spirit he or she has become part of nature, a contributor to the scheme of things that grow. And the gardener has grown with them.

Thus, health and beauty go together, satisfaction and calm observation support one another, weeds and vegetables and flowers enter into a union of living joy in which we participate. D. C.

Garden Calendar --- December

Medium Temperate Zone: Fertilizing fruit trees in December is an old practice. Meadows as well as lawns respond well to liquid fertilizing at this time. Trees can be pruned and cleaned. Place wire guards around fruit trees against rabbits. Old-timers used to wind strings soaked in fat around the trees for the same purpose.

Bulbs and tubers must be regularly inspected, if stored. Carnations, wallflower, primulas should be kept in cool rooms; but they also should be given light and air. Most Northern flowers are in their rest period and must not be given much water; warm-climate pot plants, such as cacti, do not make much growth and should therefore receive but a minimum of water lest they start rotting. Hyacinths and early tulips, freesias, oxalis, and other forcing flowers must be guarded both against gas fumes and cold draft pushing in at the windows. The typical Christmas flowers, Cyclamen and Poinsettia, cannot be acclimated in the average Northern home. Enjoy them while they last.

This is the time to think of your friends, the birds, especially the insect eaters which may, in cold weather, not find enough food without your help.

Look after mulches and covers. Air root cellars. Clean stored leafy vegetables.

Southern Gardens: You can sow vegetable seeds of the hardier sorts, especially spinach, root crops, Swiss chards. Sow hardy annuals, such as sweet peas, dianthus, chrysanthemums, calendula. If you have a sheltered spot, now is the time to sow mignonette. But it must be protected against February frosts.

Old Rule: December nights, when cold and clear,
Usher in a fertile year.

Compost and Fungi

By H. K. MEYER

HAVING ordered a number of seeds of evergreens, both trees and shrubs, I decided to give them a specially prepared bed that would be close to natural conditions. In nature, you know, the seed bed is not finely powdered soil, but rather a mulch rich in organic matter, especially leaf mold. So I went up to my wood lot and collected four buckets full of partially or fully decomposed oak and maple residues and spaded down the material, in an open frame, adding a mere sprinkling of good hoof and horn meal, to supply organic nitrogen at the same time. These seeds will go in just before the soil gets frozen. In this way, I expect to keep possible rodent enemies out of the premises and give those hard seeds a chance to undergo their natural freezing. When the freezes and thaws work on the seed coats, cracking them open, the young embryos can come forward, just as they would in a clearing of the natural forest.

As I gathered the leaf mold, scraping the ground between the stones, I came across many fine hair roots feeding right on the surface in this rich organic matter. But more important for the purpose of this writing, I came across not a few mycelia, those whitish slimy strings of mushrooms which form the major part of the fungus plants. The toadstools or mushrooms which raise their shapely and manicolored heads above ground are merely the reproductive organs, the carriers of the spores, by means of which propagation takes place. The main plant is the mycelium below. Leaf mold seems to be a product mainly of fungus action. The earthy smell in the forest is different from the odor of freshly broken garden or farm soil. It has more acid pungency, it also has a peculiar crumbliness and coolness different from garden soil though it rarely gets soaking wet. Garden soils and good farm soils do not have the same richness in organic matter and, while an organically fertilized field, is a treat to our sense of smell when we plow it in spring, its earthy fragrance is more yeasty and aromatic than the mouldy mushroom smell of the forest floor.

I have now seven compost heaps in different stages of decomposition. Those which have leaf mold added are by all means the best, possibly because they were better aerated during the wet year we encountered in 1945. Then it is also likely that, with the leaves, a goodly portion of fungus spores were incorporated in the heaps. At a relatively early stage after their construction, these spores had grown through the heaps as could be seen from the toadstools that cropped up all over the sides of the heaps.

Let us recapitulate the stages through which a well-made heap goes. After it is properly built in layers or by mixing the elements in the right proportion of one part animal matter to three parts plant residues, with sprinklings of earth and limestone, a good-sized heap of approximately five feet height will heat up. This is the stage when airborne bacteria are active. When

the heap is turned, these same bacteria continue until the volume has gone down. In the compacted heap then, other bacteria take over, those which live under exclusion of air. If the heating process goes on as it should, no odors of ammonia are given off and consequently no valuable nitrogenous matter is sent out into the air. At this stage, fungi also appear. You pull out a piece of corn stalk or some other obstinate piece, like a sunflower stalk; it has broken down into a bundle of moist fibers and among them you see the white and gray growths of fungus mycelium. Everybody has seen those fungus growths in the woods or sometimes in pulling out weeds to whose roots such fungi were attached. These attached fungi are the mycorrhizae so often mentioned in organic writings, fungi which live in close association with the plants. They derive part of their nourishment from the roots while adding their own substance in the same way. Rose gardeners who grow their own understock or who like to make divisions of established older plants for purposes of rejuvenation have undoubtedly come across such fungi.

As you pull out a likely rose, cutting it with your spade near the clump from which it issued, you notice more often than not that such a division is poorly rooted. The brown underground part is almost like the green stem above ground, only here and there a root protruding. But close to its beginning, where it came out of the old rootstock, you find it circled and stringed with white fungus growth. Partly, these fungi are parasitic, but you cannot deny that the rose bush is in good health and that the fungus growth enveloping the old clump cannot be harmful. It is not. It helps just as much as roots would. When you plant your poorly rooted rose division, do not cut off the brown parts with the fungi. They will help the rose in getting established.

When now you look again at your compost heap, you find the same kind of fungi going through it. As long as they are not present, you have a rather smeary compost consisting of lumps and moist bundles of plant matter; when the fungi take over, this moisture is withdrawn and the heap becomes crumbly like leaf mold. It is, of course, commonly known that mushrooms shoot up over night after a warm rain, and also that mushrooms consist to the greatest extent of water, but it is not at all known what this moisture-gathering capacity of the fungi does to the surrounding land. In watching your compost heap, you come to the conclusion that these fungi help in the economy of nature by balancing the available water supply. When moisture is plentiful, as after the bacterial digestion of a compost heap, the fungi have optimum growth conditions; when later they too dry out, their moisture is partly absorbed back into the compost.

That is the time when you can use your material. I must warn the gardener not to try to raise seedlings in pure compost, for two reasons. Young plants are easily attacked by fungi and compost is rich in fungi, as we have seen. On the other hand, every seed carries enough nourishment in it to get the young plant established in relatively poor soil, even in sand or sphagnum moss. Mixing compost with garden soil is all right when later you prick out the young seedlings and transplant them into flats and, perhaps still later, in pots. By this time, they are ready to absorb plant food and need richer soil than

for sprouting. And now, of course, your compost is mixed with garden earth and the fungi are kept in check. This sounds perhaps technical and complicated, but is quite simple. Put some good compost in a seed flat and water it: you are apt to see little toadstools arise. But mix the compost with garden earth and water it, and differently from your first experience no mushroomy growths will appear.

Fungi and Compost—this topic is inexhaustible. But two points should be before your eyes or, rather, before your nostrils. When you build the heap and have bad odors arising, you are losing nitrogen. To combat this, you want to put on an earth cover and keep the heap moistened. If your heap gets warm and does not smell, you have a good heap and will get good compost. The next nose test is the fungus smell. When the material has lost its stringiness and becomes crumbly like leaf mold or the flour in a decayed tree trunk, moist and rich, but not wet in places, rather a uniform substance, you can easily inhale the fungi fragrance, that rich indescribable, but easily recognized scent of the woods. Then your compost is ready for application.

Compost-making is such a hobby with some people that they neglect their gardening. That I consider as a case of putting the cart before the horse. Compost is made for a purpose. You want it because, with it, you can raise better and healthier plants. Through compost, moreover, you can thus improve your own health and satisfaction. But just the same, there is considerable immediate satisfaction in making good compost. You learn a lot about the workings of nature. You see what goes on everywhere in life as you watch the decay of some plant substances and animal matters and the rise of others. You have before your eyes and noses a model laboratory in biology. And as you increase your wealth in rich compost, you anticipate the pleasure you will have when your phyllocacti will bloom profusely, when your tuberous begonias will again surprise you with their chaste flowers, when your lilies will send up stems loaded with fragrant trumpets, and when your beans exceed your expectations as they grow and grow and bloom and bloom and produce bushels of string beans. In all these doings of nature, the fungi have their part. Without them, you would never get that rich yeasty humus soil which so many of our flowers and vegetables seek.

Onions In Winter

A RECENT ITEM in our *Garden Calendar* brought forth several inquiries. It was said that onion sets could be put out during late fall. "Are onions hardy?" was the question. A good many varieties of onions are just like tulips which we plant in October and leave out through the coldest months. Among those most suitable for winter-growing are the so-called Egyptian or Tree Onions, which were described in Mr. Barlow's article under the scientific term *Multiplier Onions*. Instead of forming seeds, these onions form bulblets on top of the stalks. Despite their juiciness, they can stand the winter cold.

Your Inheritance ---
The Fresh Produce of a Fertile Soil

By SIR ALBERT HOWARD, C. I. E., M. A.

Excerpts from a lecture given during the Teachers' Residential Course at Hockerill Training College, July 31st, 1945

IF I were asked to sum up the results of the work of the pioneers of the last twelve years or so on the reform of agriculture, I should reply that a fertile soil means healthy crops, healthy live stock, and last, but not least, healthy human beings. As mankind feeds on the produce of the soil and on the animals which consume this produce, it is obvious that the capacity of the land to grow the kind of food which results in abounding health concerns all of us no matter whether we live and work in the town or in the country-side or in both. The most important crop this island of GreatBritain can produce is a race of healthy men and women. This is only possible if the soil is fertile. Once we arrange for this we need not plan anything else or bother our heads about the social services of to-morrow or the Beveridge Plan, or any other scheme. A fertile soil will soon grow the people who can arrange their own affairs much better than we can. But for all this to happen we must first enter into our inheritance—the fresh produce of a fertile soil. This is the theme of my lecture to-day.

If soil fertility is such an important factor, why have not official agencies already dealt with this matter? Why should it be left to a group of pioneers? The answer to these questions is obvious the moment we critically examine the activities of the three Ministries—Agriculture, Food and Health—which deal with soil fertility and its implications. The real subject is divided up and therefore suffers from a common disease of the administration-fragmentation. It is broken up into bits. Once a subject such as this is fragmented it is easy to lose direction and to miss the things that matter. Think of what would happen if we took down one of Turner's masterpieces, which used to adorn the National Gallery, cut it up into pieces and tried to sort out the fragments into those which dealt with air, with the land, and with the sea, and handed these over to the experts of the Ministries of Air, Land and Water. We should no doubt obtain in due course a multitude of learned disquisitions on these fragments, which would then be used as food for endless commissions and committees. The original painting in a sense would still remain in being, but its meaning and its purpose would have been lost. This is what has happened in the important matter under discussion. Departmentalism, with all the best intentions in the world, has destroyed the subject itself. We are only left with the fragments.

The ideal piece of evidence for

driving home the fact that a fertile soil is the real basis of preventive medicine is that given by resident communities like boarding schools with sufficient land for growing some or most of their own food. Such pieces of evidence are already available. I will quote two examples.

The first is that of St. Martin's School, Sidmouth, where for many years the vegetables and fruit needed in the school were raised from fertile soil. The results are summed up in the following letter dated November 24th, 1943 from the Headmaster, the Rev. W. S. Airy:

'When I opened a preparatory school at Sidmouth in 1914, I was fortunate in finding a residence equipped with one acre of vegetable garden and another of fruit trees, together with the guidance of a wise and gifted gardener. From the day I came no type of artificial manure or fertilizer has been known on the premises. Our soil, which has always been dressed annually with some ten or twelve loads of farmyard manure, the contents of poultry houses in the grounds, and two compost heaps, enjoys immunity from insect pests and disease.

'From 1914 to 1941, when war conditions compelled us to give up boarders, all boys were daily supplied with an abundance of fruit and vegetables, also with lettuce, radishes, cucumbers, and tomatoes in season. They were provided with savoys, cauliflowers, beet, onions, peas, beans, parsnips, asparagus, etc., which all flourished in perfect condition. Our exceptional health record has been chiefly due to the school menu. I firmly believe that this would have proved impossible, had not the soil been maintained in a superlative state of fertility by means of compost beds and farmyard manure. Epidemics were unknown during the last fifteen years. We had many lads who came to us as weaklings and left hearty and robust; they never looked back in point of health and are now playing a prominent part in the world crusade of to-day. It has always been my conviction that health, strength, and self-reliance are mainly dependent upon the quality of feeding in preparatory schools at the critical period between nine and fourteen years'.

The second case is that of the College of St. Columba, Rathfarnham, near Dublin, an illustrated account of which was published in the issue of *Sport and Country* of March 17th 1944. This is a more complete example. The boys of this college in their spare time are looking after a large farm of some 200 acres, fifty of which are under cultivation, where most of their food is grown by means of compost made on the spot from vegetable and animal residues. The boy labour is voluntary and supplements that of a paid staff of experienced land workers. The farm is managed by a committee of masters, workers, and boys. Produce is sold by the farm to the college at market prices, and in this way the farm has been able to pay its way, buying its own stock and equipment. There is no doubt that the experiment has been of immediate practical value in helping to solve the war-time difficulties of catering. The health of the community generally has been unusually good and the work and games have continued with additional zest. The main significance is, however, the fact that the boys are being educated to appreciate the rhythm of Nature and to understand intelligently her influence on the whole life, while their power of concentration and observation have increased.

More such examples are in the making. Many more are required. It may not always be possible to furnish such complete examples as that which St. Columba's college will soon provide, but valuable supporting evidence can be obtained by means of school gardens, school meals, and particularly by factory canteen meals, where the produce is fresh and obtained from fertile soil round the factory.

One example of factory canteen meals of the right standard must be quoted. This was provided during the war by the Co-operative Wholesale Society's bacon factory at Winsford in Cheshire. These pioneering canteen meals at Winsford were one of the results of the Manager, Mr. George Wood, becoming interested in nutritional problems. This factory is a modern one and was surrounded by an area of waste land which was transformed into a model vegetable garden by means of compost made partly from the wastes of the factory. The potatoes and other vegetables needed in the canteen meals were made partly from the wastes of the factory. The potatoes and other vegetables needed in the canteen meals were grown on this land. The potatoes were cooked in their skins and the whole of the tuber was eaten. The area under cultivation is being increased and soon it will be possible to provide all the food needed for the canteen meals from fertile soil. Only whole wheat bread is provided. Already the health efficiency, and well-being of the labour force has markedly improved. The output of work has increased; absenteeism has been notably reduced. Here is an example of what can be accomplished for his workers by a manager with vision and enterprise at no cost to the undertaking, as such factory meals pay their way. The workers benefit by excellent meals far more nutritious and far cheaper than they can obtain elsewhere. The factory benefits by better and more willing work, by the growth of real *esprit de corps* and by a marked reduction in ill health. Work begins to go with a swing once the food of the workers comes to them fresh from soil in good fettle. Here is a simple method of dealing with industrial fatigue and of bringing capital and labour into a similar happy partnership as already exists between any good farmer and his team.

The basis of all the examples I have quoted is a fertile soil.

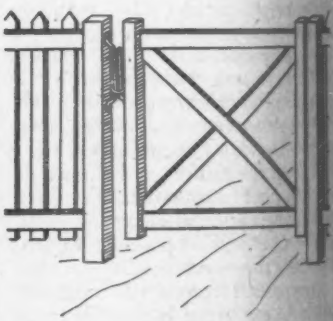
What is a fertile soil and what produces fertility in a soil? The answer is: The quality of the humus it contains. What is this humus on which so much depends? Humus is a very wide term covering material ranging from peat in a bog to the sweet-smelling leaf mould found on the ground in a mixed wood. To secure a fertile soil we must furnish it with abundant supplies of humus of a quality as near as possible to the best leaf mould. We can most easily understand the nature of humus and how to make it in a garden if we observe how it arises by natural means. Humus formation is particularly active in any wood during the late spring and summer. If we examine the litter under the trees, we shall find that this material is made up of two constituents: (1) all kinds of vegetable wastes such as dead leaves, fragments of bark, twigs, and so forth from the trees and undergrowth, and (2) animal waste provided by the extensive animal population, many of which are minute, which lives in every wood. There is much more vegetable waste than animal waste—the proportions are at least 4 vegetable to 1 animal.

The point to remember is that both classes are thoroughly mixed, kept moist by rain, and lightly packed so that ample access to air is easy. Soon a transformation begins. Moulds appear which begin to rot the wastes. The moulds are succeeded by bacteria and soon the mixed wastes are changed into dark, sweet-smelling leaf mould. Humus has been synthesized. It is made up of the undecayed portions of the mixed wastes and the remains of the moulds and microbes which have fermented these wastes. But the leaf mould does not remain long on the ground. It is distributed throughout the top soil by Nature's manure distributors, of which the earthworm is the chief. The roots of the trees and undergrowth then make use of the humus for growth. In this way the wood manures itself. It first converts its wastes into valuable humus, distributes this humus by means of its unpaid labour force, and then uses the humus for growth.

Gardening Devices

GATE LATCH

THE small as well as the big farmers need gates. Animals, however, even the best fed, like exploring. Animals are curious and enjoy holidays and therefore manage to open many a gate that seemed safely secured. The sliding-ring system, shown in the drawing should prove a puzzler to any farm animal. The ring is loose and slides up very easily. For an ordinary garden gate it is likewise suitable, since the posts may settle to a goodly extent before the latch fails to work. If it is properly made, you can even push the ring up with your elbow when the hands are full. So many other latches require a free hand, but the experienced gardener always



likes to carry two sprinkling cans for the sake of balance and rarely has one hand free. During the winter months, you can make such a latch right in your basement work shop.

Interesting Letters Department

ORGANIC TOMATOES

Sept. 30th, 1945.

Was much interested in your article, Raw Foods, as I am pretty much of a raw foodist myself, living on raw fruits and vegetables, with the exception of *one* steamed vegetable each day. For protein I use raw almonds, pecans, etc.

This simple diet has solved my nutritional problem, most satisfactorily, laxatives and cathartics are a thing of the past in our home, and since we have learned to raise our fruit and vegetables the organic way our health has improved one hundred per cent.

Our neighbor presented us with a basket of very fine looking tomatoes a few days ago. He uses chemical fertilizer exclusively and wished to impress us with the size and quality of his fruit. I served some of the fruit for dinner along with some from my garden. His had a very acid taste and a peculiar metallic flavor, we could not eat them, after having become accustomed to the sweet delicious flavor of humus grown fruit. We were really astonished at the difference.

We are also gratified with results obtained by using ground limestone on our fruit trees. We have arrested blight in our pear trees and believe we will obtain a bumper crop next year. All in all we are sold one hundred per cent on the organic way and are most grateful that we discovered your valuable magazine. We could not garden without it.

Mrs. H. J. Schauer,
Roseville, Calif.

PLOWMAN'S FOLLY

Sept. 11, 1945.

I have never read "Plowman's Folly" but I suppose it is against plowing the ground. When we came to California we lived where I could look out a couple blocks and see a Japanese home. They had leased the place after I moved here. From our dining table I could see the Jap plowing. First he used a twelve inch plow and turned the ground, then harrowed it. Then he used a disk plow and went over it, then harrowed it, then leveled it. I remarked to my husband that he must have that ground in fine shape. We had a rain and in a few days I saw the Jap plowing. I said, the weeds must be coming up so he is plowing again. Well he plowed, harrowed, disked, harrowed and leveled it again. I wondered what he was going to plant. The ground sure must be fine by now. Well in another couple weeks he was plowing again, and went through it all again. I said if that was in Colorado I would say he had plowed it to death. Five times he repeated, plowing, harrowing, disking, harrowing and leveling. It worried me, and what was he going to plant. Finally they started to set out strawberry plants. They drew the dry dirt from the top, put in the plant, and if they put a cup of water on it I never saw them. It was several weeks before he ditched it to irrigate, then he leveled the irrigating ditch, and next time ditched it the opposite way. Those ditches were at least a foot deep.

When the runners were long enough to set plants, they put them in rows, and ditched only one way. The next year they started in December to pick berries, they were the Klondike, a variety many commercial growers plant. They have berries in the winter and spring when berries are high in price. Then they picked berries the second year, and after the spring crop was gone they plowed it up and planted tomatoes or lettuce.

I soon found out that in that adobe soil if it wasn't plowed like he had it would be hard as a rock after a few irrigations. When the Jap planted lettuce in another place, a white man neighbor planted his also. He plowed the ground once and harrowed it. Then planted the lettuce and it was more weeds than lettuce. The Jap plowed his three times and harrowed before planting, and the few weeds they hand hoed. Now I do not favor Japs but I know they had better crops.

Mrs. H. O. Le Mon,

Los Angeles, Calif.

—o—

EUCALYPTUS LEAVES

Sept. 11, 1945.

Organic Gardening:

In several of the Organic magazines, I notice that people ask about the use of *camphor* and *Eucalyptus leaves* in compost and the question of there being too much oil in the leaves. If any one is observant, they should know that the leav that have fallen naturally do n contain much oil. Both campho and Eucalyptus shed their leav the year around. Some being fro the year previous and with th Eucalyptus, they say some leav are two years old. Now when th leaf is ready to fall you can s there is not the life in it or oil th new growth has. I have noticed particularly because we gather fresh, large blue leaves of E. Gl bulus, (blue gum) that is used t make the oil, and put them on hot plate (metal) and let the smoke, and inhale that *smoke* f *asthma or colds*. Old leaves do n smoke well, so we try to gather th young large leaf that is very blu I am certain if they are put in wi fresh green grass and fresh manu that they will compost, althou they will take longer the same a coarse stems of twigs. We had very large Eucalyptus tree, in fa it was four trees. Sometime it ha been cut down and there were fo trunks a foot in diameter. Ever day in the year you had to swee leaves. We wouldn't any more tha cut the lawn and gather all leav than a slight wind would spre more leaves. In the East you gath your leaves in the fall, but here th broadleaf evergreens shed all ye round. You are never throug sweeping leaves. Well in that pla we had plenty of earthworms, o pecially where manure or leaves ha been allowed to rot.

Mrs. H. O. Le Mon,

Los Angeles, Cal

Reader's Correspondence

Send stamped self-addressed envelope for reply.

TURNING COMPOST

Q. In making up my compost heap I have followed your directions exactly, but can not find complete information about the first turning operation.

The question in mind is whether it is necessary to again place small *boughs or clippings from branches, on the ground onto which to turn the pile?* Page 30 speaks of the first turn but does not answer my question.

Also I have placed a mulch of old hay over the pile. Shall I first rake this off, or turn in?

C. D., Westborough, Mass.

A. While some of the instructions we have issued from time to time suggest the placing of branches of trees as a base for the compost heap, we have never used this method on our farm. It seems to be a sloppy thing and secondly it does not give the heap contact with the earth which is desirable. When the ground is continually used in the same place for a compost heap, it becomes very rich with bacteria and fungi and it acts thus as an activator for the heap. We would, therefore, suggest not using these branches at the bottom. The purpose, of course, of these boughs was to aerate the heap more. I have seen some of the finest compost made without any aeration provided at the bottom.

Before turning the heap, it is advisable to take off the hay mulch and then place it back on again.

ORGANIC MATERIALS

Q. I wish to start a garden and plant shrubs, etc. and as yet do not have a compost heap, although I intend to start one. Would you please advise me as to whether I can mix a compost of dried blood, bone meal, cottonseed meal, etc. *Just how and what amounts of the above are to be included?*

Mrs. C. A. K., Elmont, L. I., N. Y.

A. If you use cottonseed meal, we should not make an addition of dried blood because it is also quite rich in nitrogen but only of bone meal which will supply phosphorus. Take two parts of bone meal to one part of dried blood or cottonseed meal, and mix with an equal amount of dirt in order to be sure that you can spread it thinly. You can always add weeds, garbage and other matter, especially sods, to increase the volume. You know, of course, that the bone meal and blood should follow upon a six-inch layer of green matter.

—o—

MUSHROOM GROWING

Q. Could you tell me how to grow mushrooms? Any kind.

A. S., Congerville, Illinois.

A. Mushroom growing is an extremely complicated process which requires a large initial investment of setting up cellars or caves at

which the temperature can be kept constantly around 57 degrees. Mushrooms will not grow if the air rises above 60 or falls below 50.

The second problem is the material that goes into the mushroom beds. You have to have great amounts of fresh horse manure which you must allow to ferment much as you would in making compost. It takes about 30 days during which the manure must be wetted and turned alternately. The temperature should be around 140 degrees. After the temperature in the center of the heap goes down to about 75, you put it in your prepared room, place the spawn in the proper distances, and see that the mushrooms can start their first growth which is underground. In about a month you should be able to add soil on top of the manure and produce mushrooms. Until the manure is spent, it will be very important that the moisture is pretty evenly kept until the mushrooms actually come out above ground. The room must be absolutely dark.

—o—

SLUDGE

Q. Does food grown on "Sewage Disposal Sludge Fertlizer Soil" become harmful for human consumption in any way? The above is a controversial question around here.

W. A. K., Versailles, Ohio.

A. We have frequently advised that sludge should be used only on lawns and ornamentals and not on food crops. Apart from the fact that sludge differs as to its constitution according to the processes used and the material that originally goes into it, health-conscious readers want the best material fe their compost, and sludge is def nitely not so good as manure. Ma nure is rich in bacteria of all sort which help in breaking down th compost material. If you have t use sludge for some reason or othe be sure that you use it in we ground-up form and not direct but in the compost heap. There also some doubt in some people mind as to whether disease orga isms are altogether killed off.

—o—

PINE NEEDLES

Q. What do you think of the u of pine needles in compost heap I have lots of pine trees, mix with oak, and of course, I can separate them. I've often hea pine needles were not good to u I find mighty rich looking leaf mo under these pines.

Mrs. C. P. B., Longview, Texas.

A. Pine needles decay slowly do, of course, leaves. They mak the soil acid if used in large quan tities, but in connection with chic en manure and other material an some lime, they should work out right. A mixture of oak leaves an pine needles is satisfactory. Don use too much of it in the compo heap on account of cakeing and im peding aeration. Rather mix so of it with weeds.

—o—

MISTAKES IN COMPOSTING

Q. Can a compost heap be t large? The reason I ask this is b cause I made a heap according directions as to layers of materi

dirt, manure, etc., but I made the pile about 8 feet wide, 14 feet long and 8 feet high. I made holes as per directions. The pile heated beautifully to about 150° and steam poured out each hole. But after 6 weeks it seems as hot as ever with steam still coming out. Should I wait until next spring for the first turn or can I leave it as it is with no turning until I use it on the garden next spring? This would save a lot of work.

T. E. S.,
Leicester, Mass.

A. Many people make their compost heaps too low and thereby do not get enough heating. Your compost heap was definitely too high. 5 feet height is the standard. This allows air to get in every spot provided, of course, that the heap is not too wide either. You state that yours was eight feet wide which is satisfactory. Heaps can be as much as ten or twelve feet wide at the bottom. In order to get proper composting now, you can either provide further air holes or make an extra turn of the heap so that the partly decayed material is mixed with the outside layers.

It would not be wise to let the heap set if it is for too long a period because the inside would overheat and destroy valuable nutritive material.

—o—

ASHES

Q. We have a large supply of wood ashes. Have used them extensively around apple trees with bad results. Are wood ashes preferable to lime and how can they be used without harm to plants?

S. N., Jamaica, Vt.

A. Fresh ashes are very alkaline but transform gradually into carbonates through absorption of carbon dioxide out of the air. They are rich in potassium and any other (rare) elements which may have accumulated in the plants from which they derive. They are very useful when properly handled. Fresh wood ashes should never be brought directly and in quantity to the roots of plants. Very few of our cultivated plants like an alkaline soil reaction. The trouble you have encountered is very likely due —beside excess of potassium—to the alkaline reaction. We prefer therefore to mix wood ashes into a compost heap. As you probably know we prefer to build up the heap in layers and there wood ashes can be used instead of a layer of lime. Lime e. g. is used in a compost heap in order to start an alkaline fermentation and break down the green material. About 15% of the entire heap (in weight) can consist of lime or wood ashes but not more without causing trouble. The ashes should be thoroughly mixed with compost so that no lumps remain. The advantage of the ashes is in the manifoldness of minerals which are present beside potassium and in a proportion very much the same as of the living plant. Should I have to compost twigs, branches, etc. of softwood which is very rich in resin, I would consider it preferable to burn them and use the ashes; for the resin and wood tar will retard fermentation towards humus. Also decaying soft wood tends to become very acid.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933.

Of Organic Gardening published monthly at Emmaus, Pennsylvania for October 1st, 1945.

State of Pennsylvania
County of Lehigh

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Jerome I. Rodale, who having been duly sworn according to law, deposes and says that he is the Editor of the Organic Gardening, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc. of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

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JEROME I. RODALE, EDITOR

Sworn to and subscribed before me this eighteenth day of October, 1945.

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